2012 ELP COMPLIANCE STATUS REPORT

Consent Decree No. 1:11-cv-13330-TLL-CEB

SECTION	TABLE OF CONTENTS
1	Compliance Status Report Cover Letter
2	ELP Compliance Status Report
3	Appendix V.G
4	Appendix V.G.29 11-23-11
5	Appendix V.G.29 5-23-12
6	Appendix V.G.34
7	Appendix V.G.35
8	Appendix Commercial Unavailability
9	Appendix Commercially Available
10	BAC Response
11	Bonney Forge Response
12	Chesterton Response
13	Cooper Response
14	Douglas Chero Response
15	Flowserve Response
16	Fluoroseal Response
17	Garlock Response
18	Information Requests
19	KF Contromatics (WATTS) Response
20	Kitz Response
21	Larsen and Toubro LLC Response
22	Metso/Jamesbury Response
23	Newman's Response
24	Orbit Response
25	Swagelok Response
26	Teadit Response
27	TYCO-KTM Response
28	Velan Response
29	Xomox/Tufline Response

July 31, 2012

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Consent Decree No. 1:11-cv-13330-TLL-CEB: ELP Compliance Status Report

Enclosed is the first annual ELP Compliance Status Report from The Dow Chemical Company ("Dow"), as required by Consent Decree No. 1:11-cv-13330-TLL-CEB. You will undoubtedly have noticed that the report is rather large, due to some very lengthy attachments. We thought it might be beneficial to explain this.

The bulk (literally) of this report consists of documentation showing Dow's efforts to find commercially available Low Emission (Low-E) valves and packing. The reason there is so much documentation, is that Dow actually contacted far more than the required number of valve manufacturers. We did this because Dow deals with so many different types of valves. It seemed best to investigate broadly, in order to ensure that we had consulted at least the minimum number of vendors for each type of valve that is potentially affected. Dow even contacted a few manufacturers with which we are not very familiar, in the hope of expanding our options. However, this obviously adds to the size of our report. The Consent Decree requires Dow to attach the relevant supporting documentation, which has become rather voluminous. Paper copies are specifically required by the Consent Decree, so we have provided you a very large amount of paper.

You will undoubtedly note that, although Dow has also contacted at least the required number of packing manufacturers, we have not contacted nearly as many packing manufacturers as valve manufacturers. This is because our initial efforts have focused on the packing vendors who attended the ISA Fugitive Emission-LDAR Symposium, and who therefore claim to have Low-E packing. It appears that these vendors are accustomed to meeting the requirements of refinery ELP decrees rather than the more stringent chemical industry ELP decrees. At this time, no packing has yet qualified as Low-E per the terms of our Consent Decree. However, at least one vendor is working with us on the terms of a warranty that may eventually suffice.

This brings up the point that our efforts to identify Low-E valves and packing are ongoing. Dow recognizes that, as provided in Appendix A to the Decree, a determination of commercial unavailability is valid for a period of one year. That has proven to be extremely important to successful implementation of the ELP. In order to meet the May, 2012 ELP implementation date for mandatory replacement or repacking, we found it necessary to complete our review by March 30, 2012. This allowed time for internal procedural steps (such as changing our piping specifications, and coordinating with the plant and the Purchasing Department), so that we could be prepared to order the correct valves or packing on short notice in the event of a leak. Not all vendors had responded by our cut-off date. Dow is still in discussion with some vendors, and we have received some late responses which will be reviewed in due course. Dow does not intend to wait until the year expires.

Based on the information provided by vendors, it was determined that certain specific gate valves (and only gate valves) from within the product line of two vendors (Bonney Forge, and Larsen and Toubro, LLC) met the Consent Decree's definition of Low-E valves. These are listed in our attachments as Commercially Available. Dow has not yet identified any Low-E ball valves, globe valves, or other types of valves that we utilize – only gate valves, and only in certain sizes and materials of construction. As noted above, no packing has yet met the definition of Low-E in our Consent Decree, but ongoing discussions with one packing vendor appear promising. As you know, the decree provides two methods for packing to be Low-E: test data, or a warranty. No packing vendor has yet provided

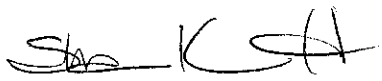
test data sufficient to meet the terms of the Decree, but it appears likely that one warranty meeting the requirements of the Decree will be available.

The Appendix to our report, titled Commercial Unavailability, provides a summary of the Low-E determination. Additionally, hard copies of all relevant documentation have been provided pursuant to the requirements set forth in Appendix A of the Consent Decree. We hope that the summary helps you to navigate the hundreds of pages of documentation.

You will be receiving some of the supporting documentation under separate cover, because it contains confidential business information. In some instances this is Dow's own information, but in a far greater number of instances the vendors claimed their information confidential. When you receive this information, you will note that we have inserted tabs corresponding to the sections in our attachment to the Compliance Status report.

If you have any questions regarding this report, please contact Vanessa Smith at 989-638-7774 or email VNowak3@dow.com.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.



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ELP Compliance Status Report

Reporting Period Required by ELP Section VI	November 23, 2011 - June 30, 2012		
Citation	Reporting Requirement		
VI.53.a	LDAR Personnel		
	Report how many LDAR Personnel are at the Facility (excluding Personnel whose functions involve the non monitoring aspects of repairing leaks)?	61	
	For each LDAR personnel what is the approximate percentage of time each such person dedicated to performing his/her LDAR function?		
	Role	Number of People in that Role	% of Time for Each Person
	Supervisor II	1	100
	Technician II	1	100
	Project Technician II	1	75
	Data Manager	1	100
	On-Call Monitoring Personnel	3	15
	Method 21 Assessor	1	10
	Audit Expertise	2	10
	Operations Personnel	40	<5
	Facility LDAR Program Contact	4	25
	Plant Technical Staff	7	5
VI.53.b	An identification and description of any non compliance with the requirements of Section V (Compliance Requirements):		
	Covered Process Unit	Requirement Identification (citation & requirement summary)	Description of non compliance condition and associated corrective action
	Ethocel ™ cellulose ethers	No non-compliances specific to the Enhanced LDAR Program (ELP) were found. However, a Hazardous Organic NESHAP (HON) issue was discovered and immediately addressed. This issue will be reported in the semi-annual HON compliance report. It is not necessarily a non-compliance; however, a description is included here for the sake of completeness.	Components were found to have been previously excluded from the HON program. Engineering estimates originally classified the equipment as being less than 5% Hazardous Air Pollutants (HAPs). Recent data indicates that the stream is at times greater than 5% HAPs. While the annual average concentration may be less than 5% HAPs, and therefore the HON may not apply, the decision was made to include this equipment in the LDAR program. Method 21 monitoring of this equipment was completed within the required timeframe of the ELP with no leaks found. Weekly visual inspections were implemented for a dual mechanical seal agitator which is one of the components referred to above. However, between the time when the components were included in the LDAR program and the time the inspection forms were updated, one visual inspection of the dual mechanical seal agitator was not performed. The missed visual inspection will be reported in the MACT and Title V reports for this facility. As a corrective action, the updated form was subsequently placed in the document management system to prevent recurrence. Additionally, the annual average concentration may be less than 5% HAPs, and therefore the HON may not apply, although the decision was made to include this agitator in the LDAR program.

ELP Compliance Status Report

VI.53.c An identification of any problems encountered in complying with the requirements of Section V (Compliance Requirements);

Requirement Identification (citation & requirement summary)	Description of problem and associated corrective action
None	None

VI.53.d The information required by Paragraph 40 of Subsection V.G (Valve and Connector Replacement and Improvement Program)

The information required by Paragraph 40 of Subsection V.G (Valve and Connector Replacement and Improvement Program)	**See Appendix V.G**: Valve and Connector Replacement and Improvement Program Report

VI.53.e A description of the trainings done in accordance with this Consent Decree

Training Identification	Summary of Training
Fugitive ELP Training - General Overview	General requirements for personnel with limited interaction with the program. Pertains to individuals such as engineering staff who order equipment, document administrators, and other office personnel.
Enhanced LDAR Program (ELP) Training - Maintenance staff	Review of requirements pertaining to repair and maintenance LDAR equipment. Includes personnel such as those that complete repairs, install equipment, install packing, and perform other maintenance activities.
Enhanced LDAR Program (ELP) Training - Operations Staff	Review of requirements pertaining to day-to-day management of the ELP requirements. Includes personnel with day-to-day field activities. They may perform repair attempts, visual inspections, and minor maintenance of LDAR equipment.
Enhanced LDAR Program (ELP) Training - Tech Staff	In-depth review of all facility specific ELP requirements. Training is given to roles including project engineers, improvement engineers, process engineers, plant leadership, facility LDAR program contacts, monitoring personnel, and program managers.
Fugitive Emission Awareness Training	General LDAR requirements provided to personnel based on their level of interaction with required fugitive emission programs.

VI.53.f Any deviations identified in the QA/QC performed under Subsection V.J as well as any corrective actions taken under that Subsection

QA/QC Deviation Description	Summary of Corrective Action
None	

VI.53.g A summary of LDAR audit results including specifically identifying all alleged deficiencies

Description of LDAR Audit Area	Summary of Results, Deficiencies, & Resolution Actions
Ethocel ™ cellulose ethers	No findings
Low Gloss ABS Unit	No findings

VI.53.h The status of all actions under any Corrective Action Plan (CAP) that was submitted during the reporting period, unless the CAP was submitted less than one month before the compliance status report

CAP Action Description	CAP Action Status Summary
Not applicable-no findings	

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

V.G.28	Commencing no later than six months after the Effective Date of this Consent Decree, and continuing until termination, Dow shall implement the program set forth in Paragraphs 29-40 to improve the emissions performance of the valves and connectors that are Covered Equipment in each Covered Process Unit. All references to "valves" in paragraphs 29-35 exclude pressure relief valves.	Effective Date:	November 23, 2011
V.G.29	List of all Existing Valves in the covered Process Unit: In the first compliance status report required under Section VI and due at least six months after the Effective Date of this Consent Decree, Dow shall include a list of the tag numbers of all valves subject to the ELP, broken down by Covered Process Unit, that are in existence as the Effective Date. The valves on the list shall be the "Existing Valves" for purposes of Paragraph 30-32.		**See Appendix V.G.29**: List of all Existing Valves in the Covered Process Unit as of the Effective Date 11/23/11. A supplemental list is included in **Appendix V.G.29 5-23-12.** This list includes the tag numbers of the valves added to the Covered Process Unit between 11/23/11 and 5/23/12. This supplemental list of tag numbers has been provided since requirements under V.G were applicable no later than six months after the Effective Date. Therefore, Dow believes it would be appropriate to voluntarily treat the valves installed between 11/23/11 and 5/23/12 in the same manner as existing valves.
V.G.30	Pro-Active Initial Valve Tightening Work Practices Relating to each New Valve that is Installed and each Existing Valve that is Repacked. Dow shall undertake the following work practices with respect to each new valve that is subject to LDAR that is installed (whether the new valve replaces an Existing Valve or in newly added to the Covered Process Unit) and each Existing Valve that is repacked.		
V.G.30.a	Upon installation (or re-installation in the case of repacking), Dow shall tighten the valve's packing gland nuts or their equivalent (e.g., pushers) to: (i) the manufacturer's recommended gland nut or packing torque; or (ii) any appropriate tightness that will minimize the potential for fugitive emission leaks of any magnitude. This practice shall be implemented prior to the valve's exposure (or re-exposure, in the case of repacking) to process fluids.		
V.G.30.b	Not less than three days nor more than two weeks after the valve first is exposed to process fluids at operating conditions, Dow shall recheck the load on the valve packing and, if necessary, shall tighten the packing gland nuts or their equivalent (e.g., pushers) to: (i) the manufacturer's recommended gland nut or packing torque; or (ii) any appropriate tightness that will minimize the potential for fugitive emission leaks of any magnitude.		

Data V.G.30.a -b

Covered Process Unit	Valve Description and/or Tag #	New Valve or Repacked/Replaced Existing Valve	Installation Date	Date of Valve Packing Load Re-Check
Ethocel ™ cellulose ethers	106312	New Valve	5/23/2012	5/26/2012
Low Gloss ABS Unit	41334	Repacked/Replaced	6/6/2012	6/11/2012
Low Gloss ABS Unit	Hand valve top of T-103 tank for LT	New Valve	6/20/2012	6/27/2012
Low Gloss ABS Unit	Hand valve top of T-104 tank for LT	New Valve	6/20/2012	6/27/2012

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

	Low Gloss ABS Unit	EBV top of T-103	New Valve	6/20/2012	Not in service as of end of current reporting period (6/30/2012)
	Low Gloss ABS Unit	EBV top of T-104	New Valve	6/20/2012	Not in service as of end of current reporting period (6/30/2012)
	Low Gloss ABS Unit	106225	New Valve	6/20/2012	6/25/2012
	Low Gloss ABS Unit	106226	New Valve	6/20/2012	6/25/2012
	Low Gloss ABS Unit	106227	New Valve	6/20/2012	6/25/2012
	Low Gloss ABS Unit	106228	New Valve	6/20/2012	6/25/2012
	Low Gloss ABS Unit	106592	Repacked/Replaced	6/27/2012	Will be performed outside of current reporting period (11/23/2011-6/30/2012)
	Low Gloss ABS Unit	106591	Repacked/Replaced	6/27/2012	Will be performed outside of current reporting period (11/23/2011-6/30/2012)
	Low Gloss ABS Unit	67256	Repacked/Replaced	6/28/2012	Not in service as of end of current reporting period (6/30/2012)
	Low Gloss ABS Unit	2963	Repacked/Replaced	6/28/2012	Will be performed outside of current reporting period (11/23/2011-6/30/2012)
	Low Gloss ABS Unit	106593	Repacked/Replaced	6/29/2012	Will be performed outside of current reporting period (11/23/2011-6/30/2012)

V.G.31 **Installing New Valves.** Except as provided in Subparagraphs 31.a, 31.b, or Paragraph 34, Dow shall ensure that each new valve (other than a valve that serves as the closure device on an open-ended line) that it installs in each Covered Process Unit, and that, when installed, will be regulated under LDAR, either is a Low-E Valve or is fitted with Low-E Packing. This requirement applies to entirely new valves that are added to a Covered Process Unit and to Existing Valves that are replaced for any reason in a Covered Process Unit.

V.G.31.a Paragraph 31 shall not apply in emergencies or exigent circumstances requiring immediate installation or replacement of a valve where a Low-E Valve or Low-E Packing is not available on a timely basis. Any such instance shall be reported in the next ELP compliance status report.

V.G.31.b Paragraph 31 shall not apply to valves that are installed temporarily for a short term purpose and then removed (e.g., valves connecting a portion of the Covered Process Unit to a testing device.)

Data V.G.31	Covered Process Unit	New Valve Tag # or Description	Low E Technology Installed (Yes or No)	If Low E Technology not used, explain (if "commercially unavailable", see **Appendix V.G. 34 and Commercial Unavailability**)
	Ethocel ™ cellulose ethers	106312	No	Commercially unavailable
	Low Gloss ABS Unit	Hand valve top of T-103 tank for LT	No	Commercially unavailable
	Low Gloss ABS Unit	Hand valve top of T-104 tank for LT	No	Commercially unavailable
	Low Gloss ABS Unit	EBV top of T-103	No	Commercially unavailable
	Low Gloss ABS Unit	EBV top of T-104	No	Commercially unavailable
	Low Gloss ABS Unit	106225	Yes	Not applicable
	Low Gloss ABS Unit	106226	Yes	Not applicable
	Low Gloss ABS Unit	106227	Yes	Not applicable
	Low Gloss ABS Unit	106228	Yes	Not applicable

V.G.32 Replacing or Repacking Existing Valves that Have Screening Values at or above 250 ppm with Low E Valves or Low E Packing.

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

V.G.32.a	a. Existing Valves Required to Be Replaced or Repacked. Except as provided in Paragraph 34, for each Existing Valve that has a Screening Value at or above 250 ppm during any monitoring event, Dow shall either replace or repack the Existing Valve with a Low E Valve or Low E Packing.
V.G.32.b	b. Timing: If Replacing or Repacking Does Not Require a Process Unit Shutdown. If replacing or repacking does not require a process unit shutdown, Dow shall replace or repack the Existing Valve by no later than one month after the monitoring event that triggers the replacing or repacking requirement, unless Dow complies with the following:
V.G.32.b.i	Prior to the deadline, Dow must take all actions necessary to obtain the required valve or valve packing, including all necessary associated materials, as expeditiously as practical, and retain documentation of the actions taken and the date of each such action;
V.G.32.b.ii	If, despite Dow's efforts to comply with Subparagraph 32.b.i, the required valve or valve packing, including all necessary associated materials, is not available in time to complete the installation within one month, Dow must take all reasonable actions to minimize emissions from the valve pending completion of the required replacing or repacking. Examples include: (a) Repair; (b) More frequent monitoring, with additional repairs as needed; or (c) Where practical, interim replacing or repacking of a valve with a valve that is not a Low-E Valve or with packing that is not Low-E Packing; and
V.G.32.b.iii	Dow must promptly perform the required replacing or repacking after Dow's receipt of the valve or valve packing, including all necessary associated materials.
V.G.32.c	c. Timing: If Replacing or Repacking Requires a Process Unit Shutdown. If replacing or repacking requires a process unit shutdown, Dow shall replace or repack the Existing Valve during the first Maintenance Shutdown that follows the monitoring event that triggers the requirement to replace or repack the valve, unless Dow documents that insufficient time existed between the monitoring event and that Maintenance Shutdown to enable Dow to purchase and install the required valve or valve packing technology. In that case, Dow shall undertake the replacing or repacking at the next Maintenance Shutdown that occurs after Dow's receipt of the valve or valve packing, including all necessary associated materials.
V.G.32.d	d. Actions Required Pending Replacing or Repacking Pursuant to Subparagraphs 32.a - c.
V.G.32.d.i	i. Actions Required Pursuant to Subsection E. Dow shall not be required to comply with Subsection E pending replacing or repacking pursuant to Subparagraphs 32.a - c if Dow completes the replacing or repacking by the date that is no later than one month after detecting the leak. If Dow does not complete the replacing or repacking within one month, or if, at the time of the leak detection, Dow reasonably can anticipate that it might not be able to complete the replacing or repacking within one month, Dow shall comply with all applicable requirements of Subsection E.
V.G.32.d.ii	ii. Actions Required Pursuant to Applicable Regulations. For each Existing Valve that has a Screening Value at or above 500 ppm, Dow shall comply with all applicable regulatory requirements, including repair and "delay of repair," pending replacing or repacking pursuant to Subparagraphs 32.a c.

Data V.G.32 a-d	Covered Process Unit	Valve/Connector Tag #	Screening Value (ppm) and Initial Monitoring Date	Date Action Was Taken and Type of Action Taken (Replace/Repack/Improve)	Any Actions Not Taken and Why	Schedule for Known Replacement, Repackings, Improvements, or Eliminations
	Ethocel ™ cellulose ethers	62152 Valve	1990 6/08/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012	Replace/Repack did not occur due to insufficient time between monitoring event and first Maintenance Shutdown.	Replace/Repack will occur by the end of the next Maintenance Shutdown, currently scheduled for: October/November 2012
	Ethocel ™ cellulose ethers	85447 Valve	799 6/11/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack to occur within 1 month of monitoring date as Maintenance Shutdown is not required.	Scheduled to occur by: 7/11/2012

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

	Ethocel ™ cellulose ethers	97363 Valve	494 6/12/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack did not occur due to insufficient time between monitoring event and first Maintenance Shutdown.	Replace/Repack will occur by the end of the next Maintenance Shutdown, currently scheduled for: October/November 2012
	Ethocel ™ cellulose ethers	103394 Valve	1379 6/12/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack requires Maintenance Shutdown	Replace/Repack will occur by the end of the first Maintenance Shutdown, currently scheduled for: July 2012
	Ethocel ™ cellulose ethers	100589 Valve	6828 6/12/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack to occur within 1 month of monitoring date as Maintenance Shutdown is not required.	Scheduled to occur by: 7/12/2012
	Ethocel ™ cellulose ethers	100859 Valve	3344 6/13/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack requires Maintenance Shutdown	Estimated date of first Maintenance Shutdown: July 2012
	Ethocel ™ cellulose ethers	100860 Valve	660 6/13/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack requires Maintenance Shutdown	Estimated date of first Maintenance Shutdown: July 2012
	Ethocel ™ cellulose ethers	106307 Valve	467 6/14/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack did not occur due to insufficient time between monitoring event and first Maintenance Shutdown.	Replace/Repack will occur by the end of the next Maintenance Shutdown, currently scheduled for: October/November 2012
	Low Gloss ABS Unit	67256 Valve	6113 6/18/2012	6/28/12 Replaced Valve	Not applicable	Not applicable
	Low Gloss ABS Unit	17302 Valve	1857 6/19/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack to occur within 1 month of monitoring date as Maintenance Shutdown is not required.	Scheduled to occur by: 7/19/2012
	Low Gloss ABS Unit	67190 Valve	1093 6/19/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack to occur within 1 month of monitoring date as Maintenance Shutdown is not required.	Scheduled to occur by: 7/19/2012

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

	Low Gloss ABS Unit	2963 Valve	363 6/21/2012	6/28/2012 Replaced Valve with a Non-Low E Valve	Replacement with Low E Valve did not occur. Low E Valve is commercially available, but was not in stock.	Installation of Low E Valve is scheduled to occur by: 7/21/2012
	Low Gloss ABS Unit	17270 Valve	897 6/25/2012	Replace/Repack scheduled to occur outside of the current reporting period (11/23/2011-6/30/2012)	Replace/Repack requires Maintenance Shutdown	Estimated date of first Maintenance Shutdown: Spring 2014
	Low Gloss ABS Unit	106593 Valve	4832 6/27/2012	6/29/2012 Replaced Valve	Not applicable	Not applicable

V.G.33	33. Provisions Related to Low-E Valves and Low-E Packing.				
V.G.33.a	a. "Low E" Status Not Affected by Subsequent Leaks. If, during monitoring after installation, a Low-E Valve or a valve using Low-E Packing has a Screening Value at or above 250 ppm, the leak is not a violation of this Decree, does not invalidate the "Low E" status or use of that type of valve or packing technology, and does not require replacing other, non-leaking valves or packing technology of the same type.				
V.G.33.b	b. Repairing Low E Valves. If, during monitoring after installation, a Low-E Valve or a valve using Low-E Packing has a Screening Value at or above 250 ppm, Paragraphs 21, 22, 24, 25, 26 and 27 shall apply.				
V.G.33.c	c. Replacing or Repacking Low E Valves. On any occasion when a Low-E Valve or a valve that utilizes Low-E Packing has a Screening Value at or above 250 ppm but below 500 ppm, Dow shall not be required to replace or repack it. On any occasion when a Low E Valve or a valve that utilizes Low E Packing has a Screening Value at or above 500 ppm, Dow shall replace or repack it pursuant to the requirements of Paragraph 32.				
Data V.G. 33 a-c	Covered Process Unit	Low E Valve Tag #	Screening Value (ppm)	Action Taken: (Replaced/Repacked/Repaired)	
	Ethocel ™ cellulose ethers	Not applicable			
	Low Gloss ABS Unit	Not applicable			
V.G.34	34. Commercial Unavailability of a Low-E Valve or Low-E Packing. Dow shall not be required to utilize a Low-E Valve or Low-E Packing to replace or repack a valve if a Low-E Valve or Low-E Packing is commercially unavailable. The factors relevant to the question of commercial unavailability and the procedures that Dow must follow to assert that a Low-E Valve or Low-E Packing is commercially unavailable are set forth in Appendix A.				**See Appendix V.G.34**
V.G.35	35. Records of Low-E Valves and Low-E Packing. Prior to installing any Low-E Valves or Low-E Packing, or if not possible before installation, then as soon as possible after installation, Dow shall secure from each manufacturer documentation that demonstrates that the proposed valve or packing technology meets the definition of "Low-E Valve" and/or "Low-E Packing." Dow shall make the documentation available upon request.				**See Appendix V.G.35**
V.G.36	36. Connector Replacement and Improvement Descriptions.				
V.G.36.a	a. For purposes of Paragraphs 37 38, for each of the following types of connectors, the following type of replacement or improvement shall apply:				
	Connector Type - Replacement or Improvement Description				
	Flanged - Gasket replacement or gasket improvement				
	Threaded - Replacement of the connector with a like kind connector or othe				
	Compression - Replacement of the connector with a like kind connector or othe				
	Cam Lock - Replacement or improvement of the gasket or replacement or improvement of the Cam Lock				
	Quick Connect - Replacement or improvement of the gasket if applicable, or replacement of the connector (with either a like kind connector or other) if there is no gasket				

Appendix V.G: Valve and Connector Replacement and Improvement Program Report

	Any type (including any of the above) - Elimination (e.g., through welding, pipe replacement, etc.)
V.G.36.b	b. In cases where replacement in kind is utilized as the method for replacing or improving a connector (e.g., a Quick Connect replaces another Quick Connect), the provisions of Subparagraphs 36.b.i and 36.b.ii shall apply.
V.G.36.b.i	i. If there are types, models or styles of a like-kind connector that are less likely to leak than the existing connector, and one or more of those types, models or styles are technically feasible to use (considering the service, operating conditions, and type of piping or tubing that the connector is in) and would not create a major safety, mechanical, product quality, regulatory or other issue, Dow shall select a like-kind connector from among such types, models or styles.
V.G.36.b.ii	ii. If Subparagraph 36.b.i does not apply, Dow may install a like-kind connector that is the same type, model or style as the existing connector.
V.G.37	37. Installing New Connectors. For each Covered Process Unit, Dow shall use best efforts, when selecting a new connector that, when installed, will be regulated under LDAR, to select a connector that is least likely to leak, using good engineering judgment, for the service, operating conditions, and type of piping or tubing that the connector is in. This requirement applies to entirely new connectors added to a Covered Process Unit and to existing connectors that are replaced for whatever reason within a Covered Process Unit.
V.G.38	38. Replacing or Improving Connectors.
V.G.38.a	a. Trigger for Replacement or Improvement Requirements. For each connector that, in any two of three consecutive monitoring periods, has a Screening Value at or above 250 ppm, Dow shall replace or improve the connector in accordance with the applicable replacement or improvement described in Paragraph 36. Dow shall use best efforts to install a replacement or improvement that will be the least likely to leak, using good engineering judgment, for the service, operating conditions, and type of piping or tubing that the connector is in.
V.G.38.b	b. Timing. If the replacement or improvement does not require a process unit shutdown, Dow shall undertake the replacement or improvement by no later than one month after the monitoring event that triggers the replacement or improvement requirement. If the replacement or improvement requires a process unit shutdown, Dow shall undertake the replacement or improvement during the first Maintenance Shutdown that follows the monitoring event that triggers the requirement to replace or improve the connector, unless Dow documents that insufficient time existed between the monitoring event and the Maintenance Shutdown to enable Dow to secure and install the replacement or improvement. In that case, Dow shall undertake the replacement or improvement at the next Maintenance Shutdown that occurs after Dow's receipt of the necessary materials.
V.G.38.c	c. Actions Required Pending Replacements or Improvements Pursuant to Subparagraphs 38.a b.
V.G.38.c.i	i. Actions Required Pursuant to Subsection E. Dow shall not be required to comply with Subsection E pending replacement or improvement pursuant to Subparagraphs 38.a b if Dow completes the replacement or improvement by the date that is no later than one month after detecting the leak. If Dow does not complete the replacement or improvement within one month, or if, at the time of the leak detection, Dow reasonably can anticipate that it might not be able to complete the replacement or improvement within one month, Dow shall comply with all applicable requirements of Subsection E.
V.G.38.c.ii	ii. Actions Required Pursuant to Applicable Regulations. For each connector that has a Screening Value at or above 500 ppm, Dow shall comply with all applicable regulatory requirements, including repair and "delay of repair," pending replacement or improvement pursuant to Subparagraphs 38.a b.

Data V.G.38	Covered Process Unit	Connector Tag #	Screening Value (ppm)	Date Action Was Taken and Type of Action Taken	Any Actions Not Taken and Why	Schedule for Known Replacements, Improvements, or Eliminations
	Ethocel ™ cellulose ethers	Not applicable				
	Low Gloss ABS Unit	Not applicable				

V.G.39	39. Nothing in Paragraphs 30 - 38 requires Dow to utilize any valve, valve packing technology, or connector that is not appropriate for its intended use in a Covered Process Unit.
V.G.40	In each Compliance Status Report due under Section VI (Reporting Requirements) of this Decree, Dow shall include a separate section in the Report that: (i) describes the actions it took to comply with this Subsection G, including identifying each piece of equipment that triggered a requirement in Subsection G, the Screening Value for that piece of equipment, the type of action taken (i.e., replacement, repacking, or improvement), and the date when the action was taken; (ii) identifies any required actions that were not taken and explains why; and (iii) identifies the schedule for any known, future replacements, repacking, improvements, or eliminations.

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

100000	100087	100182	100242	100307	100410	100497	100577	100647
100001	100088	100183	100243	100308	100411	100500	100579	100648
100002	100093	100186	100244	100309	100412	100501	100581	100651
100004	100095	100187	100245	100312	100415	100502	100582	100652
100005	100098	100188	100246	100316	100417	100503	100583	100653
100006	100100	100189	100247	100317	100419	100505	100584	100655
100007	100102	100190	100248	100318	100421	100506	100585	100659
100011	100104	100191	100249	100320	100424	100508	100586	100660
100013	100108	100192	100250	100321	100428	100510	100587	100661
100015	100109	100193	100251	100323	100429	100511	100588	100662
100016	100110	100194	100252	100324	100432	100512	100589	100663
100020	100111	100195	100253	100325	100433	100517	100590	100664
100021	100113	100196	100254	100327	100434	100519	100591	100669
100022	100117	100197	100255	100330	100437	100520	100592	100670
100026	100119	100198	100257	100331	100439	100521	100594	100673
100029	100121	100199	100259	100344	100442	100523	100599	100675
100030	100122	100200	100260	100345	100444	100524	100600	100676
100031	100124	100201	100261	100346	100445	100525	100601	100677
100034	100125	100202	100262	100347	100446	100527	100605	100678
100035	100128	100203	100263	100349	100452	100528	100606	100679
100036	100129	100204	100264	100351	100453	100532	100607	100680
100037	100130	100205	100265	100353	100455	100533	100608	100681
100040	100131	100206	100266	100355	100457	100535	100609	100682
100041	100135	100207	100267	100356	100461	100537	100611	100686
100042	100136	100209	100268	100362	100463	100539	100612	100687
100043	100137	100210	100269	100365	100465	100541	100613	100689
100044	100139	100211	100270	100367	100466	100543	100616	100690

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

100046	100150	100212	100271	100369	100467	100545	100617	100691
100054	100151	100214	100274	100373	100468	100548	100618	100692
100059	100154	100215	100278	100376	100469	100549	100619	100693
100061	100155	100218	100279	100377	100470	100550	100620	100698
100062	100156	100219	100282	100378	100471	100551	100622	100700
100065	100161	100220	100283	100381	100476	100552	100625	100702
100066	100162	100221	100284	100382	100477	100553	100626	100705
100068	100163	100223	100285	100383	100478	100554	100628	100707
100069	100165	100224	100286	100385	100482	100555	100629	100709
100070	100167	100227	100288	100393	100483	100562	100630	100711
100072	100168	100228	100289	100396	100485	100563	100631	100712
100073	100169	100232	100290	100397	100486	100564	100632	100713
100074	100172	100234	100291	100399	100487	100565	100634	100715
100075	100173	100235	100292	100400	100488	100566	100635	100716
100077	100174	100236	100293	100401	100489	100568	100636	100717
100078	100176	100237	100294	100402	100490	100570	100637	100718
100079	100177	100238	100297	100405	100491	100572	100640	100721
100081	100178	100239	100298	100406	100492	100573	100641	100724
100084	100179	100240	100300	100407	100493	100574	100642	100725
100085	100180	100241	100304	100408	100494	100575	100643	100726
100729	100803	100866	100938	101102	101173	101289	101363	101432
100732	100804	100867	100941	101103	101174	101291	101364	101435
100733	100805	100868	100943	101104	101175	101293	101365	101436
100734	100807	100870	100944	101105	101176	101294	101368	101437
100735	100808	100873	100948	101106	101177	101295	101369	101439
100736	100809	100874	100950	101107	101178	101296	101370	101440
100738	100811	100875	100952	101108	101179	101299	101371	101443

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

100740	100812	100876	100953	101109	101180	101300	101374	101445
100741	100813	100878	100955	101110	101181	101301	101375	101446
100742	100814	100879	100957	101111	101182	101302	101376	101447
100750	100815	100880	100960	101112	101183	101304	101380	101448
100751	100818	100884	100966	101113	101189	101305	101381	101449
100752	100819	100886	100967	101114	101190	101308	101382	101450
100753	100820	100890	100968	101119	101191	101310	101384	101451
100754	100821	100891	100971	101123	101192	101314	101385	101452
100756	100823	100892	100972	101124	101193	101315	101386	101454
100757	100824	100893	100974	101126	101209	101318	101387	101455
100758	100826	100894	100977	101127	101218	101319	101388	101456
100759	100827	100895	100978	101128	101219	101320	101389	101457
100760	100828	100896	100979	101129	101220	101323	101390	101458
100761	100829	100897	100980	101130	101221	101324	101391	101459
100762	100830	100898	100981	101131	101227	101326	101392	101460
100763	100831	100901	100982	101140	101228	101328	101393	101461
100764	100832	100902	100983	101141	101229	101329	101394	101462
100765	100833	100903	100984	101142	101230	101330	101395	101463
100766	100838	100904	100985	101143	101231	101332	101398	101465
100771	100839	100905	100988	101145	101232	101333	101399	101466
100772	100840	100906	100990	101146	101236	101334	101401	101467
100776	100841	100907	100991	101147	101237	101335	101402	101468
100777	100842	100908	100992	101148	101238	101336	101404	101469
100779	100843	100910	100993	101150	101239	101338	101406	101470
100780	100844	100911	100996	101151	101240	101339	101407	101471
100781	100845	100913	100997	101152	101244	101342	101409	101472
100782	100846	100916	101000	101153	101245	101343	101410	101473

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

100783	100847	100917	101012	101154	101246	101344	101411	101474
100785	100848	100918	101013	101156	101262	101345	101412	101475
100786	100849	100922	101014	101158	101266	101346	101413	101477
100787	100850	100923	101015	101159	101267	101347	101414	101478
100788	100851	100924	101016	101160	101269	101349	101415	101479
100789	100852	100929	101017	101161	101272	101350	101416	101480
100791	100853	100930	101018	101162	101273	101351	101419	101481
100792	100854	100932	101023	101165	101276	101352	101420	101482
100794	100857	100933	101026	101166	101277	101353	101421	101483
100795	100858	100934	101027	101167	101278	101354	101423	101484
100796	100859	100935	101030	101168	101283	101360	101424	101485
100800	100860	100936	101033	101171	101284	101361	101425	101486
100801	100865	100937	101034	101172	101288	101362	101430	101487
101488	101544	101621	103269	104203	106522	11384	12719	20802
101489	101545	101622	103270	104204	106523	11398	12720	20803
101490	101546	101623	103271	104205	106527	11399	12724	20808
101491	101547	101624	103272	104751	106530	11402	12725	20809
101492	101549	101625	103273	104755	106531	11416	12727	20811
101495	101550	101626	103276	104758	106532	11417	12729	20812
101497	101551	101627	103277	105600	106533	11418	12731	20813
101498	101552	101628	103278	105701	106535	11459	12732	33599
101499	101554	101630	103279	105702	106536	11460	12735	40108
101500	101555	101632	103280	105703	106537	11462	12744	40140
101501	101556	101633	103282	105704	106538	11463	12745	40144
101502	101557	101636	103284	105705	106539	11467	12751	40145
101503	101559	101641	103284	105706	106540	11470	12752	40146
101504	101563	101643	103285	105708	106541	11471	12754	40147

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

101505	101564	101647	103286	105710	10964	11479	13130	40837
101506	101566	101649	103360	105711	10965	11493	13131	41596
101507	101567	101650	103361	105712	10967	11495	13134	42802
101508	101569	101651	103363	105713	10969	11496	13136	61475
101509	101570	101652	103364	105714	10972	11903	13140	62115
101510	101579	101655	103382	105715	10973	12202	13142	62118
101511	101584	101657	103383	105716	10975	12204	13143	62119
101512	101585	101658	103384	105717	10977	12214	13144	62123
101513	101586	101659	103385	105718	10979	12228	13145	62124
101514	101587	101660	103386	106203	10988	12229	13147	62125
101515	101588	101661	103387	106205	11000	12230	13149	62128
101516	101589	103240	103388	106209	11304	12248	13151	62129
101518	101590	103241	103391	106210	11305	12249	13156	62130
101519	101592	103242	103393	106211	11311	12251	13159	62131
101521	101593	103243	103394	106215	11312	12255	13160	62132
101522	101594	103244	103395	106216	11314	12256	13161	62141
101523	101595	103245	103396	106222	11315	12273	13163	62142
101524	101596	103247	103397	106305	11317	12304	13164	62144
101525	101597	103248	103398	106323	11319	12308	13165	62145
101527	101601	103249	103399	106324	11321	12312	13167	62146
101528	101608	103250	103400	106326	11322	12326	13173	62148
101530	101609	103251	103440	106327	11330	12340	13179	62151
101533	101610	103252	103481	106328	11331	12341	13180	62152
101534	101611	103253	103482	106329	11334	12342	13184	62153
101535	101612	103254	103483	106330	11356	12343	13186	62155
101536	101613	103255	103485	106331	11358	12345	13189	62156
101537	101614	103256	103486	106332	11361	12350	13190	62157

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

101538	101615	103257	103487	106400	11365	12400	13192	62158
101539	101616	103259	103488	106401	11366	12422	13199	62159
101540	101617	103261	103489	106403	11367	12451	13200	62160
101541	101618	103264	103490	106404	11368	12460	20795	62161
101542	101619	103265	104201	106520	11371	12463	20796	62162
101543	101620	103266	104202	106521	11372	12498	20800	62164
62167	77867	84709	84801	84878	85456	85698	97361	98384
62176	77868	84710	84802	84879	85457	85699	97362	99149
62494	77869	84711	84803	84880	85458	88247	97363	99151
64368	77870	84712	84804	84881	85461	88248	97365	99227
64378	77875	84713	84805	84882	85463	88249	97366	99230
64396	77876	84714	84806	84883	85464	88251	97367	99231
64400	77877	84715	84814	84884	85465	88252	97368	99298
64428	77878	84717	84815	84885	85466	88253	97369	99299
64437	77879	84718	84816	84886	85467	88255	97370	99300
64484	77881	84722	84817	84888	85469	88256	97372	99301
64487	77882	84723	84818	84891	85470	88257	97375	99302
64489	77883	84727	84819	84892	85471	88259	97376	99303
71905	77884	84728	84822	84896	85472	88261	97377	99304
71906	77885	84729	84823	84898	85473	88263	97378	99305
73551	77886	84730	84829	84900	85474	89736	97380	99306
73552	77889	84732	84830	84901	85501	90656	97382	99307
73553	77891	84737	84831	84902	85502	90657	97383	99307
73554	77892	84738	84832	84905	85503	90658	97384	99308
73555	77893	84741	84838	84906	85504	90659	97386	99309
73556	77894	84742	84839	84907	85505	90660	97388	99310
73557	77895	84749	84842	84910	85506	90661	97647	99311

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Ethocel ™ cellulose ethers

73558	77898	84750	84844	84911	85507	90662	97648	99312
73559	77899	84754	84845	84912	85508	90665	97650	99313
73560	77900	84755	84847	84913	85509	92797	97651	99314
74919	77901	84756	84849	84915	85510	92798	97652	99316
74924	77903	84759	84850	84916	85511	92799	97653	99318
74926	77904	84760	84851	84917	85512	92800	97654	99319
74928	77905	84761	84853	84918	85547	93464	97655	99320
74930	77906	84768	84854	84920	85548	93466	97656	99321
74931	77907	84769	84855	84921	85549	93467	98241	
77839	77910	84770	84856	84929	85550	93999	98242	
77841	84682	84771	84857	84930	85551	96859	98243	
77842	84683	84772	84858	84932	85552	96861	98244	
77847	84686	84775	84859	84933	85553	97290	98245	
77848	84687	84776	84860	84934	85554	97292	98247	
77849	84688	84777	84861	84935	85555	97293	98249	
77850	84689	84785	84862	84936	85556	97295	98259	
77855	84690	84786	84863	84937	85557	97296	98260	
77856	84691	84787	84866	84938	85558	97297	98261	
77857	84692	84789	84868	85444	85559	97298	98262	
77858	84693	84790	84870	85446	85560	97350	98263	
77859	84694	84794	84871	85447	85691	97351	98263	
77861	84695	84795	84873	85450	85692	97352	98264	
77862	84696	84796	84874	85452	85693	97355	98265	
77864	84697	84797	84875	85453	85695	97358	98266	
77865	84704	84798	84876	85454	85696	97359	98267	
77866	84705	84799	84877	85455	85697	97360	98383	

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

102213	102290	106217	106588	14945	15600	15879	16060	16268
102214	102291	106220	106591	14946	15704	15881	16067	16303
102215	102292	106221	106592	14952	15705	15889	16069	16304
102216	102293	106223	106593	14970	15708	15897	16076	16306
102217	102294	106543	10804	14973	15709	15898	16088	16307
102218	102295	106544	10805	14991	15712	15901	16099	16308
102219	102297	106545	10807	15298	15715	15902	16102	16310
102220	102298	106546	10808	15299	15716	15903	16105	16314
102221	102299	106547	10812	15300	15718	15905	16107	16328
102222	102300	106549	10813	15340	15719	15906	16111	16330
102223	10261	106550	10814	15341	15720	15907	16112	16334
102224	10262	106551	10815	15344	15721	15911	16114	16335
102226	10265	106552	10816	15385	15722	15912	16118	16336
102233	10266	106553	10817	15410	15725	15913	16119	16337
102234	10268	106554	10819	15434	15726	15914	16120	16338
102249	10269	106555	10820	15438	15727	15915	16125	16339
102250	10270	106556	10828	15439	15728	15919	16126	16340
102251	10278	106557	10830	15440	15730	15920	16129	16342
102252	10279	106558	10864	15442	15731	15921	16143	16344
102253	10287	106559	10867	15443	15732	15923	16144	16345
102254	10288	106560	10868	15444	15734	15925	16166	16346
102255	10294	106561	10870	15445	15740	15926	16167	16348
102256	10295	106562	10875	15468	15741	15937	16174	16349
102257	10296	106563	11011	15474	15743	15938	16180	16352
102258	10298	106564	11013	15475	15757	15940	16182	16353
102259	10300	106565	11017	15476	15762	15941	16183	16357
102260	103231	106566	11019	15477	15803	15943	16193	16361

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

102261	103232	106567	11022	15478	15804	15948	16194	16363
102262	103233	106568	11026	15479	15805	15951	16196	16370
102263	103234	106569	11028	15482	15808	15954	16221	16371
102264	103235	106570	11030	15483	15826	15956	16223	16376
102266	103236	106571	11032	15500	15828	15960	16224	16377
102267	103237	106572	11033	15575	15829	15961	16238	16381
102272	103238	106573	11034	15585	15830	15977	16239	16383
102273	103239	106574	11035	15586	15834	15981	16240	16385
102274	103953	106575	11038	15587	15836	15982	16246	16386
102275	103954	106576	11041	15589	15838	15985	16248	16391
102276	103955	106577	11047	15590	15844	16037	16249	16394
102277	103956	106578	11052	15591	15851	16038	16250	16396
102278	103957	106579	14756	15592	15861	16039	16251	16399
102279	103958	106580	14760	15593	15868	16044	16254	16404
102280	103959	106581	14771	15594	15869	16045	16255	16410
102282	103961	106582	14773	15595	15874	16047	16257	16418
102283	103962	106583	14777	15596	15875	16049	16258	16419
102284	103963	106584	14783	15597	15876	16054	16259	16420
102285	105526	106585	14784	15598	15877	16055	16264	16423
102286	106132	106587	14786	15599	15878	16057	16267	16437
16438	16548	16721	16836	16926	17011	17101	17217	17303
16443	16550	16731	16837	16927	17020	17103	17218	17305
16446	16551	16732	16851	16928	17021	17105	17219	17307
16447	16552	16733	16867	16929	17022	17106	17220	17308
16448	16553	16734	16868	16930	17023	17107	17222	17317
16449	16556	16735	16869	16931	17024	17108	17224	17335
16451	16557	16736	16871	16935	17025	17109	17225	17404

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

16455	16568	16737	16872	16936	17026	17111	17227	17406
16457	16569	16738	16873	16938	17030	17113	17231	17407
16458	16573	16739	16874	16939	17031	17115	17233	17408
16459	16574	16740	16875	16940	17032	17116	17236	17409
16460	16576	16741	16876	16941	17033	17117	17241	17410
16467	16578	16742	16881	16942	17034	17119	17242	17411
16469	16579	16743	16883	16946	17035	17120	17243	17412
16472	16586	16744	16884	16948	17036	17121	17245	17413
16473	16591	16747	16885	16950	17037	17130	17255	17415
16474	16593	16748	16888	16951	17039	17131	17256	17416
16475	16594	16750	16890	16952	17040	17132	17257	17417
16476	16595	16751	16891	16953	17042	17133	17258	17418
16478	16596	16752	16893	16954	17043	17134	17261	17420
16479	16597	16755	16894	16955	17044	17135	17262	17422
16480	16598	16756	16895	16957	17049	17136	17264	17423
16481	16599	16757	16896	16958	17050	17140	17265	17424
16483	16601	16761	16897	16959	17051	17141	17266	17427
16484	16604	16762	16898	16960	17052	17144	17267	17428
16485	16619	16764	16900	16968	17053	17145	17268	17429
16486	16624	16766	16901	16971	17057	17147	17269	17431
16487	16626	16767	16902	16977	17058	17148	17270	17432
16488	16636	16768	16903	16979	17059	17149	17271	17433
16490	16637	16777	16905	16982	17062	17152	17272	17434
16498	16638	16781	16906	16983	17075	17173	17273	17435
16499	16639	16782	16907	16985	17078	17175	17275	17437
16502	16640	16787	16908	16986	17079	17176	17276	17439
16503	16641	16788	16909	16987	17080	17179	17277	17440

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

16509	16681	16789	16910	16988	17081	17180	17282	17443
16510	16689	16791	16912	16992	17082	17183	17283	17448
16512	16690	16793	16913	16993	17083	17185	17284	17449
16516	16691	16796	16914	16994	17085	17187	17286	17450
16521	16692	16797	16916	16997	17086	17194	17289	17451
16525	16693	16798	16917	16998	17087	17197	17293	17452
16526	16699	16800	16918	17001	17089	17198	17294	17454
16529	16700	16821	16919	17003	17090	17200	17295	17456
16531	16701	16829	16920	17004	17091	17203	17296	17457
16533	16702	16830	16921	17006	17092	17206	17297	17458
16536	16714	16831	16922	17007	17093	17208	17298	17459
16539	16716	16832	16923	17008	17098	17214	17300	17460
16546	16719	16833	16924	17010	17100	17216	17302	17461
17462	17582	17675	17819	17936	18020	18220	18425	18568
17464	17583	17676	17824	17937	18021	18242	18426	18569
17465	17584	17680	17826	17939	18022	18257	18427	18571
17466	17585	17681	17827	17940	18023	18258	18428	18572
17467	17592	17682	17828	17941	18024	18259	18431	18574
17469	17595	17683	17829	17942	18025	18260	18433	18575
17470	17599	17684	17830	17949	18026	18262	18434	18580
17471	17605	17688	17831	17950	18027	18263	18435	18581
17473	17607	17689	17832	17951	18028	18266	18436	18583
17474	17610	17690	17833	17952	18035	18268	18438	18588
17475	17611	17691	17834	17958	18132	18276	18439	18589
17476	17614	17692	17835	17959	18142	18277	18440	18600
17477	17615	17706	17836	17960	18143	18282	18441	18604
17478	17616	17707	17837	17962	18149	18286	18446	18609

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

17480	17617	17708	17840	17963	18151	18290	18447	18614
17481	17619	17715	17841	17968	18152	18292	18448	18615
17482	17620	17726	17842	17969	18153	18293	18449	18617
17483	17623	17728	17843	17970	18159	18294	18450	18619
17484	17624	17729	17844	17971	18160	18355	18451	18621
17486	17626	17730	17845	17972	18163	18357	18452	18622
17492	17627	17731	17846	17973	18164	18361	18453	18625
17493	17628	17734	17847	17974	18165	18362	18454	18629
17495	17633	17735	17848	17975	18168	18382	18455	18637
17496	17634	17738	17850	17980	18169	18383	18456	18638
17497	17639	17739	17851	17981	18170	18387	18457	18639
17500	17640	17740	17852	17982	18174	18388	18458	18645
17501	17641	17741	17853	17983	18175	18389	18468	18646
17502	17642	17742	17856	17984	18176	18391	18477	18648
17507	17643	17745	17857	17985	18177	18392	18480	18657
17508	17644	17746	17858	17986	18178	18393	18481	18661
17509	17645	17748	17859	17987	18179	18394	18486	18663
17510	17647	17749	17860	17988	18183	18395	18487	18667
17511	17649	17750	17861	17990	18190	18396	18535	18668
17521	17651	17752	17862	17991	18191	18398	18537	18669
17523	17652	17754	17864	17994	18193	18401	18538	18673
17524	17655	17760	17865	17995	18194	18404	18541	18674
17526	17656	17761	17873	17997	18195	18408	18548	18675
17528	17657	17762	17882	17998	18196	18409	18550	18676
17529	17661	17764	17883	18001	18197	18410	18552	18678
17530	17662	17767	17885	18006	18200	18411	18553	18679
17531	17663	17768	17890	18007	18204	18413	18555	18680

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

17540	17665	17769	17898	18008	18205	18415	18556	18683
17565	17666	17773	17904	18009	18208	18418	18558	18684
17573	17668	17774	17913	18014	18209	18419	18559	18685
17575	17670	17776	17920	18017	18211	18420	18561	18687
17580	17672	17780	17929	18018	18212	18421	18565	18691
17581	17674	17783	17934	18019	18219	18423	18567	18708
18709	18828	20788	25323	3225	3393	3707	37542	3772
18710	18832	20789	25324	3226	3395	3708	37544	3773
18711	18842	20790	25327	3228	3397	3709	3755	3774
18716	18846	20791	25328	3230	3398	3716	37550	3776
18720	18849	20793	25329	3237	3399	3732	37554	3777
18723	18850	20794	25330	3238	3400	3735	37556	3778
18724	18851	25238	25331	3239	3601	3736	37557	3780
18726	18852	25243	25333	3240	3602	3737	37558	3781
18727	18853	25247	25334	3241	3603	3739	37559	3782
18728	18854	25249	25336	3242	3606	3740	3756	3784
18730	18855	25256	25338	3250	3607	3741	37562	3787
18732	19086	25257	25340	3254	3611	3742	37563	3788
18734	19401	25260	25342	3255	3612	3744	37564	3792
18736	19402	25262	25343	3256	3615	3745	37565	3793
18738	19408	25263	25346	3257	3619	3746	37567	3794
18740	19482	25264	25348	3262	3623	3749	3757	3797
18741	19704	25266	25355	3267	3647	3750	37570	3798
18749	19705	25267	25358	3274	3651	37502	37573	3800
18754	19710	25268	25365	3277	3655	37503	37574	38010
18757	19711	25270	25368	3281	3656	37504	37575	38012
18758	19712	25272	25486	3282	3658	37505	37578	38013

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

18759	19718	25274	25487	3287	3659	37507	3758	38014
18760	19719	25275	25488	3325	3664	3751	37580	38015
18764	19730	25276	26481	3348	3665	37513	37581	38016
18765	19731	25277	26482	3354	3666	37514	37582	38017
18773	19735	25278	26487	3355	3669	37515	37584	38018
18774	19736	25280	2940	3356	3671	37519	37585	38021
18775	19737	25283	2942	3361	3677	3752	37586	38022
18776	19738	25285	2950	3364	3678	37520	37587	38034
18784	19739	25286	2952	3367	3680	37521	37588	38036
18785	19740	25287	2956	3368	3681	37522	37589	38037
18786	19741	25288	2957	3371	3683	37524	37590	38038
18787	19742	25292	2958	3373	3684	37525	37591	38039
18788	19743	25294	2960	3374	3685	37526	37592	38042
18789	19744	25295	2961	3375	3686	37527	37593	38043
18790	19749	25296	2963	3376	3688	37528	37594	38044
18793	19750	25297	2969	3377	3689	37529	37595	38045
18797	19751	25301	2970	3378	3691	37530	37596	38048
18798	19752	25302	2971	3379	3692	37531	37597	38049
18801	19753	25305	2972	3380	3693	37532	37599	38050
18802	19754	25307	2973	3381	3694	37534	3763	38052
18811	19755	25309	30840	3382	3695	37536	3764	38055
18814	19756	25310	30841	3384	3696	37537	3765	38056
18815	19757	25312	3201	3386	3698	37538	3766	38057
18818	20108	25315	3204	3387	3700	37539	3767	38064
18821	20784	25318	3211	3388	3701	37540	3768	38067
18822	20785	25322	3215	3390	3706	37541	3771	38068
38071	3890	4082	41512	41794	42148	54106	64446	66531

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

38072	3903	4083	41513	41795	42151	54107	64460	66540
38073	3906	4084	41515	42062	42152	54108	64476	66543
38075	3907	4088	41516	42063	42153	54109	64490	66549
38080	3908	4090	41517	42069	42154	54110	64781	66550
38084	3945	4091	41519	42070	42157	54115	64782	66551
38087	3946	4093	41520	42071	42160	54116	65690	66552
38089	3956	4095	41528	42072	42161	54117	65692	66553
38090	3957	4096	41529	42073	42164	54118	65693	66563
38091	3959	4097	41530	42074	42165	54119	65694	66575
38093	3981	4099	41531	42079	42166	54120	65697	66576
38095	3988	4100	41537	42080	42167	5791	65702	66580
38096	3990	4102	41545	42081	42168	5792	65705	66581
38100	3999	4104	41549	42082	42173	5793	65708	66583
38101	40203	4105	41550	42083	42175	5794	65709	66585
3819	40206	4106	41558	42084	42176	5795	65715	66586
3820	40208	4108	4156	42088	42177	5798	65717	66587
3823	40209	4109	41560	42089	42178	59043	65718	66591
3825	40210	4110	41565	42090	42179	59045	65719	66705
3828	40211	4111	41566	42091	42193	59046	65720	66706
3829	40212	4112	41567	42092	42301	59047	65727	66707
3830	40439	4128	41570	42093	42304	59048	6588	66708
3831	40444	4129	41572	42097	42305	59997	6594	66709
3834	40445	41334	41580	42098	42311	59999	6595	66710
3835	40446	41335	41582	42099	42314	60000	6598	66711
3836	40447	41336	41584	42100	42318	60350	66400	66712
3839	40448	41347	4159	42110	42324	60351	66402	66713
3840	40449	41348	4166	42113	42325	64260	66403	66714

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

3841	40450	41349	4169	42114	47049	64270	66404	66715
3842	40451	4135	4172	42115	47050	64272	66407	66716
3847	40456	41350	4174	42122	54004	64283	66409	66717
3854	40461	41445	41749	42123	54005	64295	66410	66720
3855	40462	41449	4175	42124	54006	64297	66411	66721
3857	40463	41454	41755	42125	54007	64311	66412	66725
3865	40466	41455	41759	42127	54008	64322	66414	66726
3869	4049	41463	41763	42128	54010	64334	66491	66728
3871	4050	41464	41764	42129	54014	64342	66492	66733
3872	4052	41467	41765	42130	54015	64352	66494	66734
3874	4053	41470	41766	42131	54016	64356	66497	66741
3876	4054	41475	41767	42133	54019	64357	66498	66839
3877	4057	41476	41768	42135	54020	64358	66509	66840
3878	4058	41496	41779	42137	54021	64365	66520	66841
3880	4060	41498	41780	42138	54022	6437	66521	66842
3881	4061	41500	41782	42143	54025	64390	66522	66844
3884	4062	41501	41783	42145	54026	64405	66523	66848
3885	4075	41504	41788	42146	54027	64442	66529	66851
3886	4081	41511	4179	42147	54105	64444	66530	66852
66853	67208	67298	72248	73591	74180	78022	78655	81171
66895	67209	67300	72250	73592	74183	78031	78656	81172
66896	67210	71287	72253	73594	74184	78032	78659	81173
66898	67211	71324	72255	73598	74185	78033	78660	84967
66899	67212	71627	72256	73599	74187	78034	78663	84968
66900	67218	71915	72257	73600	74191	78035	78664	84969
66901	67219	71916	72259	74097	74194	78036	78665	84971
66906	67220	71919	72261	74098	74195	78040	78701	84972

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

66911	67221	71920	72262	74100	74196	78041	78702	84973
66913	67224	71921	72263	74102	74200	78045	78703	84974
66914	67225	71923	72266	74103	74201	78046	78708	84975
66918	67226	71950	72267	74104	74202	78047	78711	85011
66921	67227	71951	72268	74106	74207	78050	78712	85013
66930	67228	71952	72269	74108	74209	78052	78713	85014
66931	67230	71954	72272	74109	74211	78053	78714	85015
66932	67231	71955	72273	74111	74213	78055	78715	85016
66935	67232	71956	72275	74112	74215	78056	78716	85028
66947	67233	71957	72282	74113	74216	78057	78717	85104
66948	67236	71958	72283	74114	74218	78058	78718	88267
66953	67237	71959	72284	74116	74219	78059	78719	90145
66960	67238	71960	72285	74117	74547	78060	78720	90146
66961	67239	71961	72833	74118	74548	78061	78721	90147
66965	67240	71962	73426	74120	74549	78062	78724	90148
66970	67243	71963	73430	74121	74711	78063	78725	90149
66974	67244	71964	73434	74122	74712	78064	78726	90151
66978	67245	71970	73435	74123	74713	78065	78730	90152
66979	67247	71971	73436	74124	74715	78066	78755	90154
66983	67252	71972	73437	74125	74716	78067	78756	90157
66992	67253	71973	73439	74126	74717	78068	78757	90158
66996	67254	71974	73441	74136	74718	78069	78758	90159
67000	67255	71975	73442	74138	74719	78070	79166	90160
67098	67256	71981	73443	74140	74720	78071	79167	90161
67099	67257	71982	73444	74141	74721	78072	79386	90162
67184	67258	71983	73445	74142	74722	78073	79387	90163
67185	67259	71984	73446	74143	74725	78074	79391	90164

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

67189	67260	71985	73564	74150	74726	78075	79392	90165
67191	67268	72235	73565	74155	74729	78076	79394	90166
67192	67269	72236	73567	74156	74730	78077	79395	90167
67194	67270	72237	73568	74157	74733	78078	79396	90168
67195	67274	72238	73573	74158	74734	78079	79399	90169
67196	67276	72241	73574	74159	74735	78080	79400	90170
67199	67283	72242	73576	74160	74736	78082	79403	90171
67200	67285	72243	73584	74162	74737	78083	79404	90173
67202	67286	72244	73585	74165	74743	78084	79405	90174
67205	67287	72245	73588	74166	74744	78649	79406	90175
67206	67293	72246	73589	74178	74745	78650	79407	90176
67207	67294	72247	73590	74179	75077	78654	79408	90177
90178	92533	9681	97332	97718	97876	97980	98173	99096
90179	92534	9682	97333	97719	97877	97981	98174	99097
90180	92535	9690	97334	97720	97879	97982	98175	99233
90181	92536	9691	97336	97721	97880	97983	98176	99322
90182	92537	9692	97337	97722	97883	97984	98177	99325
90185	92538	9693	97339	97723	97885	97985	98178	99326
90186	92539	9697	97342	97726	97886	97986	98179	99327
90189	92543	97178	97343	97727	97887	97987	98180	99329
90190	92544	97201	97344	97728	97888	98128	98181	99330
90191	92919	97202	97345	97729	97889	98129	98182	99337
90192	92921	97204	97346	97730	97890	98130	98183	99338
90193	92991	97205	97437	97731	97892	98131	98184	99339
90194	92993	97210	97438	97732	97893	98132	98185	99340
90195	92996	97211	97439	97733	97894	98133	98187	99341
90196	9372	97213	97440	97737	97898	98134	98189	99343

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

90197	9381	97214	97441	97740	97901	98135	98190	99348
90594	9382	97215	97442	97741	97902	98136	98252	99349
90595	9384	97216	97664	97743	97912	98137	98253	99350
90596	9395	97225	97667	97801	97914	98138	98269	99351
90598	9396	97226	97668	97802	97915	98139	98270	99352
90599	9398	97227	97669	97808	97917	98140	98271	99353
90600	9400	97228	97670	97811	97918	98141	98579	99354
90601	9402	97233	97671	97812	97923	98142	98580	99355
90602	9404	97235	97673	97813	97924	98143	98581	99356
90603	9406	97236	97675	97828	97926	98145	98582	99357
90604	9409	97237	97679	97829	97928	98146	98583	99358
90609	9423	97238	97680	97832	97929	98147	98584	99359
90610	9448	97239	97682	97833	97933	98148	98587	99360
90612	9461	97240	97683	97834	97934	98149	98588	99361
90614	9462	97241	97684	97839	97940	98150	98589	99362
90625	9467	97242	97685	97848	97945	98151	98591	99363
90663	9474	97248	97691	97849	97948	98154	98592	99364
90718	9477	97249	97694	97850A	97949	98155	98593	99365
90719	9479	97257	97700	97851	97950	98156	98732	99367
90721	9484	97261	97701	97853	97967	98157	98733	99368
90732	9486	97262	97703	97854	97968	98158	98966	99369
90733	9489	97264	97704	97855	97969	98159	98967	99370
90734	9616	97277	97705	97856	97970	98160	98968	99371
90738	9626	97282	97707	97857	97971	98162	98969	99372
90751	9627	97283	97708	97858	97972	98163	99082	99373
91292	9628	97284	97709	97859	97973	98164	99083	99374
91293	9642	97285	97710	97860	97974	98165	99084	99375

Appendix V.G.29: List of all Existing Valves in the Covered Process Unit 11/23/11

Low Gloss ABS Unit

91296	9645	97286	97711	97861	97975	98166	99085	99376
91297	9646	97308	97713	97864	97976	98167	99087	99377
91298	9648	97319	97715	97866	97977	98169	99088	99378
91299	9664	97320	97716	97867	97978	98171	99089	99379
91300	9673	97326	97717	97868	97979	98172	99095	99380
99384	99393	99399						
99385	99394	99400						
99386	99395	99420						
99387	99396	99937						
99389	99397	99938						
99390	99398	99939						
99391								

Appendix V.G.29: Supplemental List of all Existing Valves in the Covered Process Unit Installed Between 11/23/11 and 5/23/12

Ethocel ™ cellulose ethers

104206
104207
104208
104786
106301
106302
106303
106304
106306
106307
106308
106310
106313

Low Gloss ABS Unit

106040
106042
106045
106046
106047
106048
106049
106050
106053
106054
106055

Appendix V.G.34 Commercial Unavailability of a Low-E Valve or Low-E Packing

V.G.34 34. Commercial Unavailability of a Low-E Valve or Low-E Packing. Dow shall not be required to utilize a Low-E Valve or Low-E Packing to replace or repack a valve if a Low-E Valve or Low-E Packing is commercially unavailable. The factors relevant to the question of commercial unavailability and the procedures that Dow must follow to assert that a Low-E Valve or Low-E Packing is commercially unavailable are set forth in Appendix A.

Covered Process Unit	Valve Tag # and/or Description	Valve Type	Size	Manufacturer	Explanation for Commercial Unavailability
Ethocel ™ cellulose ethers	106312	Ball	3/4"	Metso/Jamesbury	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	41334	Ball	3"	BAC	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	Hand valve top of T-103 tank for LT	Ball	2"	Jamesbury	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	Hand valve top of T-104 tank for LT	Ball	2"	Jamesbury	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	EBV top of T-103	Ball	3"	Jamesbury	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	EBV top of T-103	Ball	3"	Jamesbury	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	106592	Ball	1/2"	Velan	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	106591	Ball	1/2"	Velan	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	67256	Control Valve: Globe	1/2"	Research	See Appendix: Commercial Unavailability
Low Gloss ABS Unit	106593	Ball	1/2"	Velan	See Appendix: Commercial Unavailability

Appendix V.G.35 Records of Low-E Valves and Low-E Packing

V.G.35

35. Records of Low-E Valves and Low-E Packing. Prior to installing any Low-E Valves or Low-E Packing, or if not possible before installation, then as soon as possible after installation, Dow shall secure from each manufacturer documentation that demonstrates that the proposed valve or packing technology meets the definition of "Low-E Valve" and/or "Low-E Packing." Dow shall make the documentation available upon request.

Covered Process Unit	Valve Tag # and/or Description	Valve Type	Size	Manufacturer
Low Gloss ABS Unit	106225	Gate	3/4"	Bonney Forge
Low Gloss ABS Unit	106226	Gate	3/4"	Bonney Forge
Low Gloss ABS Unit	106227	Gate	3/4"	Bonney Forge
Low Gloss ABS Unit	106228	Gate	3/4"	Bonney Forge

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Ball Valve	BAC	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed according to TA-Luft and results reported in leak rate.	See: BAC Response
Ball Valve	Cooper	No	No warranty provided.	No	No test data provided for ball valves.	See: Cooper Response
Ball Valve	Hoke (Tubing Valves)	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Ball Valve	KF Contromatics (WATTS)	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	No	Company stated they would not provide low emission valves to the specifications of the Consent Decree.	See: KF Contromatics (WATTS) Response
Ball Valve	Kitz	No	Questionnaire states that the company will provide a warranty. However, no warranty or test data was provided initially. Warranty was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	No	No test data was provided initially. Test data was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	See: Kitz Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Ball Valve	KTM	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	No	Company provided data that did not meet specifications of the Consent Decree. EB series was tested to ISO 15848-1, Annex A (leak rate). For the KTM Omni Series, internal testing did not follow Good Engineering Practices (GEP). For single packing gland valves, a packing adjustment took place after every leak of 1 ppm occurred. KTM secondary packing gland utilizing PTFE packing material may meet testing specifications of the Consent Decree. Graphite packing testing did not meet the specifications of the Consent Decree. Valves in flammable service require graphite/PTFE combination, KTM did not test this packing combination.	See: TYCO-KTM Response
Ball Valve	Metso/ Jamesbury	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	No	Company did not provide data to meet the specifications of the Consent Decree. Company stated that they only had valve testing data that follows ISO 15848 specifications and results are reported in leak rate.	See: Metso/ Jamesbury Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Ball Valve	Orbit	No	Company stated they would not provide a warranty to the specifications of the Consent Decree	No	Company did not provide complete testing data. A summary was provided for an API 622 test that was conducted on a 3x3 class 600 which stated that the average leak was less than 100ppm. However a maximum leak was not stated. The company also provided summaries of valve test data that was conducted per ISO 15848-1 Annex A (leak rate). This is a rising stem ball valve that is infrequently used at the Covered Process Units due its functionality.	See: Orbit Response
Ball Valve	Swagelok (Tubing Valves)	No	Company stated that all products are covered under a standard lifetime warranty, but the warranty does not meet the specifications of the Consent Decree.	No	Company did not provide data to meet the specifications of the Consent Decree. Test data was not provided, however a summary letter was provided stating the testing was completed per ISO 15848-1 (leak rate) and results are correlated to be below 100 ppm.	See: Swagelok Response
Ball Valve	Velan	N/A	Response provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	N/A	Testing provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	See: Velan Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Ball Valve	Worcester	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Butterfly Valve	Dezurik	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Butterfly Valve	Grinnell	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Butterfly Valve	Metso/ Jamesbury	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	No	Company did not provide data to meet the specifications of the Consent Decree. Company stated that they only had valve testing data that follows ISO 15848 specifications and results are reported in leak rate.	See: Metso/ Jamesbury Response
Butterfly Valve	Xomox	No	Questionnaire stated warranty would be available for selected valves, but did not provide an example.	No	Full test results were not provided, only a summary of results were provided. Testing procedure did not include thermal cycles. Also, any leak above 500 ppm was adjusted and not included in calculating an average leak.	See: Xomox/Tufline

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Gate Valve	Bonney Forge	No	Company warranty did not meet the specifications of the Consent Decree.	Partial	Test data provided for 3/4" 800# forged steel valve and 4" Class 300 cast steel valve. See Available Valve appendix.	See: Bonney Forge Response
Gate Valve	Cooper	No	No warranty provided.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed per ISO 15848-1 (leak rate).	See: Cooper Response
Gate Valve	Douglas Chero	No	Company indicated that a warranty could be provided, however, they did not provide a warranty.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed per ISO 15848-1 (leak rate).	See: Douglas Chero Response
Gate Valve	Kitz	No	Questionnaire states that the company will provide a warranty. However, no warranty or test data was provided initially. Warranty was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	No	No test data was provided initially. Test data was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	See: Kitz Response
Gate Valve	Ladish	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Gate Valve	Larsen and Toubro LLC	N/A	Company did not indicate that a warranty could be provided.	Partial	Company provided data that met specifications of the Consent Decree. Test data provided was for 4" gate valve Class 300. See Available Valve appendix	See: Larsen and Toubro LLC Response
Gate Valve	Neway	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Gate Valve	Newco	No	Company warranty did not meet the specifications of the Consent Decree.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed per ISO 15848-1 (leak rate).	See: Newco Response
Gate Valve	SWI	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Gate Valve	Velan	N/A	Response provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	N/A	Testing provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	See: Velan Response
Gate Valve	Vogt	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Globe Valve	Bonney Forge	No	Company warranty did not meet the specifications of the Consent Decree.	No	No globe valve test data was provided.	See: Bonney Forge Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Globe Valve	Cooper	No	No warranty provided.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed per ISO 15848-1 (leak rate).	See: Cooper Response
Globe Valve	Douglas Chero	No	Company indicated that a warranty could be provided, however, they did not provide a warranty.	No	No globe valve test data was provided.	See: Douglas Chero Response
Globe Valve	Kitz	No	Questionnaire states that the company will provide a warranty. However, no warranty or test data was provided initially. Warranty was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	No	No test data was provided initially. Test data was provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	See: Kitz Response
Globe Valve	Ladish	N/A	Company did not provide a response	N/A	Company did not provide a response.	See: Information Requests
Globe Valve	Neway	N/A	Company did not provide a response	N/A	Company did not provide a response	See: Information Requests

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Globe Valve	Newco	No	Company warranty did not meet the specifications of the Consent Decree.	No	Company provided data that did not meet specifications of the Consent Decree. Valve testing completed per ISO 15848-1 (leak rate).	See: Newco Response
Globe Valve	SWI	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Globe Valve	Velan	N/A	Response provided after Dow's determined response date of 3/30/12. This information will be evaluated in due course.	N/A	Testing provided after Dow's determined response date of 3/30/12, therefore the testing is pending review. This information will be evaluated in due course. However, no globe valve data was provided.	See: Velan Response
Globe Valve	VOGT	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Needle Valve	Hoke (Tubing Valves)	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests
Needle Valve	Parker (Tubing Valves)	N/A	Company did not provide a response.	N/A	Company did not provide a response.	See: Information Requests

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Needle Valve	Swagelok (Tubing Valves)	No	Company stated that all products are covered under a standard lifetime warranty, but the warranty does not meet the specifications of the Consent Decree.	No	Company did not provide data to meet the specifications of the Consent Decree. Test data was not provided, however a summary letter was provided stating the testing was completed per ISO 15848-1 (leak rate) and results are correlated to be below 100 ppm.	See: Swagelok Response
Plug Valve	Durco	No	No warranty provided.	No	No test data provided.	See: Flowserve Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Plug Valve	Fluoroseal	No	No warranty provided.	No	Company did not provide data to meet the specifications of the Consent Decree. The test procedure provided for the 2" Class 150 Severe Service plug valve did not include thermal cycles. Testing took place at ambient temp. 2" Class 150 plug valve, test data indicates max leak at 561ppm. Testing did not include thermal cycles. Testing took place at ambient temp. Test data provided for 6" Class 600 Fluoroseal Plug Valve, 1" Class 600 Fluoroseal Plug Valve, 2" Class 600 Fluoroseal Plug Valve, 2" Class 600 Fluoroseal Severe Service Plug Valve, and 8" Class 600 Fluoroseal Plug Valve and results were reported in leak rate.	See: Fluoroseal Response
Plug Valve	Tufline	No	Questionnaire stated warranty would be available for selected valves, but did not provide an example.	No	Full test results were not provided only a summary of results were provided. Testing procedure did not include thermal cycles. Also, any leak above 500 ppm was adjusted and not included in calculating an average leak.	See: Xomox/Tufline Response

Appendix: Commercial Unavailability

Equipment Type	Manufacturer Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Reference Material
Packing	Chesterton	N/A	Chesterton stated they were preparing a draft warranty on 4/24/12. Once the draft warranty was created, it was provided to Dow. Revisions were required and the revised warranty is pending review. This information will be evaluated in due course.	N/A	Test data provided after Dow's determined response date of 3/30/12, therefore the testing is pending review. This information will be evaluated in due course.	See: Chesterton Response
Packing	Garlock	N/A	No warranty provided prior to Dow's determined response date of 3/30/12. Warranty was provided on 6/15/12 and is pending review. This information will be evaluated in due course.	No	No testing data provided.	See: Garlock Response
Packing	Teadit	N/A	Draft warranty provided after Dow's determined response date of 3/30/12. Warranty is pending review. This information will be evaluated in due course.	N/A	Testing summaries provided after Dow's determined response date of 3/30/12, test data is pending review. This information will be evaluated in due course.	See: Teadit

Appendix: Commercially Available

Equipment Type	Nominal Valve Size	Manufacturers Surveyed	Acceptable Warranty (Yes or No)	Explanation	Acceptable Testing Data (Yes or No)	Explanation	Low E Valves Commercially available	Reference Material
Gate Valve	Cast Steel: 2-24 inch Forged Steel: Full Port- 1/4-2 inch Forged Steel: Reduced Port- 1/2-2 inch	Bonney Forge	No	Company stated they would not provide a warranty to the specifications of the Consent Decree.	Yes	Test data provided for 3/4" 800# forged steel valve and 4" Class 300 cast steel valve.	Yes: Bonney Forge Cast Carbon Steel Gate Valves built to API 600 Yes: Bonney Forge Forged Carbon Steel Gate Valves built to API 602	See: Bonney Forge Response
Gate Valve	Pressure Class 150: 2-48 inch Pressure Class 300: 2-30 inch	Larsen and Toubro LLC	N/A	Company did not indicate that a warranty could be provided	Yes	Company provided data that met specifications of the Consent Decree. Test data provided was for 4" gate valve Class 300.	Yes: Larsen and Toubro LLC Cast Carbon Steel Gate Valves built to API 600	See: Larsen and Toubro LLC Response

BAC Response

Smith, Vanessa (A)

From: Russ Christian [rchristian@columbiapipe.com]
Sent: Friday, February 17, 2012 9:01 AM
To: DeVine, Dan (DJ)
Subject: Fw: LDAR Low Fugitive Emission Questionnaire
Attachments: Low-E Valve Questionnaire - BAC VALVES.PDF; image002.png; image003.jpg

Dan

See attached response

Russ Christian

Sent from my Verizon Wireless Phone

-----Original message-----

From: Esteve Bernal <esteve.bernal@bacvalves.com>
To: Russ Christian <rchristian@columbiapipe.com>, "devinedj@dow.com" <devinedj@dow.com>
Cc: 'Theo Borgemeester' <theo.borgemeester@bacvalves.com>, Tomas Paradinas <tomas.paradinas@bacvalves.com>, "'Laura Albó'" <laura.albo@bacvalves.com>, Josep Ma Sanchez <josepma.sanchez@bacvalves.com>
Sent: Fri, Feb 17, 2012 07:42:12 GMT+00:00
Subject: RE: LDAR Low Fugitive Emission Questionnaire

Dear Sirs,

Please find attached our response to your questionnaire, with regards to the fugitive emissions our company is working more in the direction of the ISO 15848.

If you have any question do not hesitate to contact us.

Best regards

Esteve Bernal
CCO
BAC VALVES, S.A
Tel. +34 972677052 Ext. 211
Mbl.+34 669371998
www.bacvalves.com

From: Theo Borgemeester [mailto:theo.borgemeester@bacvalves.com]
Sent: Wednesday, January 04, 2012 12:22 PM

To: 'Esteve Bernal'
Cc: 'DeVine, Dan (DJ)'; 'Dayries, Richard [HDS]'; 'Tammy Whitmer [HDS]'; 'Russ Christian'
Subject: FW: LDAR Low Fugitive Emission Questionnaire
Importance: High

Esteve, I forward to you the request of Russ Christian of Sunbelt/Columbia Midland MI on behalf Dan DeVine of Dow Midland Engineering Solutions to have BAC Valves S.A. filling out the attached Low-E Valve Questionnaire as defined in the email below.
Could you please have this followed up?
Thanks

Theo Borgemeester
BAC VALVES S.A.
Business Development USA
Phone +1 203 878 3968
Mobile +1 203 747 4591
http://www.bacvalves.com

From: Russ Christian [mailto:rchristian@columbiapipe.com]
Sent: Wednesday, January 04, 2012 11:02 AM
To: 'Tony Boland'; 'Mark Slayton'; 'Adam Ryan (aryan@coopervalves.com)'; 'Mark Cottrell'; wayne.gallupe@metso.com; 'Janet Green'; 'Sumit Gupta'; 'jstewart@kennedyind.com'; 'brianm@kitz.com'; Terry Thurn (tthurn@tycovalves.com); Terry Thurn (tthurn@tycovalves.com); 'BDiStefano@ladishvalves.com'; 'mcoles@newdellco.com'; 'tom.stricklen@c-a-m.com'; 'landerschier@forberg.com'; 'rkim@swivalves.com'; 'jyonkman@lockwoodint.com'; clark.kreutzberg@midlandvf.com; stmiller@flowserve.com; 'sales-hoke@circortech.com'; Roger Shemberger (rscontrols@rscontrols.com); Rick Anderson (randerson@xomox.com); 'jhlee@tyvalve.co.kr'; 'larry@fluorosealvalves.com'; 'sales@douglas-chero.com'; 'jason.legendre@f-e-t.com'; 'theo.borgemeester@bacvalves.com'
Cc: 'DeVine, Dan (DJ)'; 'Dayries, Richard [HDS]'; Tammy Whitmer [HDS]
Subject: LDAR Low Fugitive Emission Questionnaire

To All,

Dow has requested that each of manufacturers listed on the attached excel spreadsheet fill out and return the following attached questionnaire.
The "Low-E Valve Questionnaire" will act as a record to determine if each manufacturer valves and valve design comply with EPA Method 21 and that the stem leakage is designed to be 100 ppm or less over 5 years of service.

This is all a part of Dow's LDAR program (leak detection and repair). The EPA's Consent Decree went into effect on November 23rd of 2011 for the Michigan Operations site and Dow has a limited time to meet compliance. Please fill the questionnaire to the best of your ability and with as much detail as you can provide.
The attached spreadsheet consist of two tabs that you'll reference to complete the questionnaire. The first tab is sorted by Mfg and includes the Dow CPPS number. The seco. tab provides a description of the Dow CPPS valve code.

I would appreciate a response that you have received this message; and please provide an estimated time for delivery of the questionnaire.
We would like a completed questionnaire no later than Friday February 17th, 2012.
Feel free to direct any questions to myself or Dan DeVine.

Regards,

Russell Christian
Regional Manager
Sunbelt / Columbia
Midland, Michigan
Ph 989-496-9260 Ext. 2001
Fx 989-496-9261
Cell 989-600-8297

As we discussed, here is the Low Fugitive Emission Questionnaire that I need to have completed. The Consent Decree went into effect on November 23rd for Michigan Operations.

If you could please assist me in collecting data, it would be greatly appreciated. (Dow has six months to get in compliance). If you can send the answers back to me I will compile the information. If we do not get responses we will need to follow up and I need to document it too.

Hopefully this will also help Sunbelt too, in case other oil or chemical companies ask for this information, if they have to deal with a Consent Decree.

There are 33 valve manufacturers, over 100 valve items codes, in the Dow pipe specifications that require this information. See attached spreadsheet. It can sorted in different ways, but I can help with that if needed. Using the first tab (called mfg) and clicking on the drop down arrows or sorting by manufacturer may be the easiest way to build a list of who all needs to be contacted.

I look forward to working with you on this. Please contact me with any questions or let me know if there is an easier way to do this or how I can help.

Thanks,

Dan DeVine
Piping DAS, Site CPPS Technical Resource,
MIOPs, WVO, ECO, and Business Aligned Sites
Piping Practices Technical Resource Leader
Engineering Solutions
The Dow Chemical Company
.400 Building, Michigan Operations
Midland, MI 48640
phone 989-636-4330

Fax 989-638-3929
email: devinedj@dow.com

LOW FUGITIVE EMISSION VALVE AND PACKING QUESTIONNAIRE

Two production units at The Dow Chemical Company **Michigan Operations Site** recently came under a Consent Decree from the EPA. One part of this Consent Decree requires installation of Low Fugitive Emission valves and/or Low Fugitive Emission valve stem packing that meets the definition shown below. It also requires supporting documentation.

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

a. Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

b. Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Therefore can you please answer **ALL** of the following questions regarding valves that could be supplied to The Dow Chemical Company, Michigan Operations Site?

COMPANY NAME: ____BAC VALVES, S.A._____

1) Will your company provide a written warranty for low emission valves as defined above? YES or NO? NO

   If YES, please describe the testing (the nature of the test and the resulting data) that supports the warranty.

   OR

2) Does your company produce valves that have been proven through testing to meet the emission limits in the definition for low emission valves? YES

If yes to the above questions, what size and type of valves that your company produces will meet this definition or warranty? Please be specific as possible (i.e. which series of valves or models numbers).

Ball? → SERIES PQR-I AND FB

Plug?

Gate?

Globe?

Butterfly?

Other?

3) Which valves, including sizes, were tested?

SEE ATTACHED TA-LUFT CERTIFICATE

4) Which valves, including sizes, are qualified per an extension?

ALL PQR-I AND FB SERIES

5) Will you provide the test data to The Dow Chemical Company for review? If yes, please include it in the response.

YES, ATTACHED YOU CAN FIND TESTING DATA

6) Does your Company offer a valve with low emission packing per the following definition? YES

"Low-Emissions Packing" or "Low-E Packing" shall mean either (i) or (ii) as follows:

(i) A valve packing product, independent of any specific valve, for which the manufacturer has issued a written warranty that the packing will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the product; provided however, that no packing product shall qualify as "Low-E" by reason of written warranty unless the packing first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty;

Or

(ii) A valve packing product, independent of any specific valve that has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions, and that, during the test, at no time leaked at greater than 500 ppm, and on average leaked at less than 100 ppm.

7) If yes, for which valves would "Low-E Packing" be offered?

ALL PQR-I AND FB SERIES

8) For which types of packing is "Low-E" status based on a written warranty?

OUR STANDARD PACKING FOR PQR-I AND FB SERIES, ATTACHED YOU CAN FIND GENERAL ASSEMBLY DRAWINGS WITH PACKING DETAIL

9) For which types of packing is "Low-E" status based on testing that shows the packing meets the emission limits in the definition above?

OUR STANDARD PACKING FOR PQR-I AND FB SERIES, ATTACHED YOU CAN FIND GENERAL ASSEMBLY DRAWINGS WITH PACKING DETAIL

10) If yes, can this Low-E Packing testing information be provided to The Dow Chemical Company for review? If yes, please include it with the response.

YES, ATTACHED YOU CAN FIND TESTING DATA

Thank you for your assistance to help meet low emission compliance.

Please contact Dan DeVine at 989-636-4330, or by email at devinedj@dow.com with questions or clarifications.

TÜV TA-Luft CERTIFICATE FOR

FB/FBL and PQR_i BAC VALVES BALL VALVES

DN 15 – DN 200 FOR PN 10 – PN 40

NPS ½" – NPS 12" FOR CLASS 150 – CLASS 300

Industrie Service

TÜV

TÜV Rheinland
Berlin Brandenburg

ZERTIFIKAT

At the request of
Armaturenvertriebsgesellschaft Alms mbH
we hereby certify that
the operating spindle penetrations of
BAC VALVE ball valves, Fig. FB, FBL and PQR-I
DN 15 - DN 200 / PN 10 - 40 (DN ½" - DN12"
ANSI Class 150 - 300)

made by

BAC VALVES
17600 Figueres (Spain)

shall be regarded, in respect of their sealing effect,
as a high quality seal as defined in TA-Luft.

Basis:

First General Administrative Order of the Federal Pollution Control Act
TA-Luft 02 - Technical Instructions for Air Pollution Control,
Section 5.2.6.4 as amended on 24 July 2002 along with VDI 2440, Section 3.3.1.3

This Certificate shall be valid in conjunction with
Test Certificate No. 922-9011163 Rev. 2 **dated** 28 February 2006.

Cologne, 28 February 2006

TÜV Industrie Service GmbH
TÜV Rheinland Group
Project Management / In-Process and On-Site Inspection

Inspector

Test No.: 922-9011163 / 05 Rev. 2

TÜV Rheinland Group

Test Certificate
on leak tests carried out on
the operating spindle penetrations of ball valves made by Bac Valves
Fig. FB, DN 20 (¾"), DN 50 (2") and DN 150 (6"), PN 40;
the DN 15 to DN 200 nominal widths are deemed also covered by this certificate
A) in relation to the requirements of Section 5.2.6.4 of TA-Luft
B) in relation to their usability in accordance with Section 3.2.1.9 of TRB 610

Customer:	Armaturenvertriebsgesellschaft Alms mbH Holterkamp 1 D-40880 Ratingen
Manufacturer:	BAC VALVES 17600 Figueres (Spain)
Test location:	ACCEL Instruments GmbH, Forschungsausrüstungen 51429 Bergisch Gladbach
Test period:	21 September 2005 to 23 November 2006
Requirements: A) TA-Luft:	In its version of 24 July 2002, Section 5.2.6.4, TA-Luft requires: "Spindle penetrations of shut-off devices and controls such as valves or slide valves shall be sealed by means of – high quality sealed metallic bellows with downstream safety gland or – equivalent sealing systems." Sealing systems are to be regarded as equivalent if it can be demonstrated in tests according to VDI 2440 (edition of November 2000) that the temperature specific leakage rates are complied with.
B) TRB:	See TRB 610, Section 3.2.1.9, Tightness of equipment and pipe connections in pressure vessels designed for the storage of gas.
Item tested:	Ball valve, BAC VALVE, Fig. FB; DN 20, ¾" / PN 40 Construction of the sealing system: in accordance with drawing FB 50-300 & FB 150-300. FPM / HNBR O rings Spindle diameter: 12 mm Ball valve, BAC VALVE, Fig. FB; DN 50, 2" / PN 40 Construction of the sealing system: in accordance with drawing FB 50-300 & FB 150-300 FPM / HNBR O rings; graphite Spindle diameter: 22 mm Ball valve, BAC VALVE, Fig. FB; DN150, 6" / PN 40 Construction of the sealing system: in accordance with drawing FB 50-300 & FB 150-300 FPM / HNBR O rings; graphite Spindle diameter: 36 mm

TÜV Industrie Service GmbH
Project Management / In-Process and On-Site Inspection
Am Grauen Stein
51105 Köln (Poll)
Telephone: 0221/806-2957
Fax: 0221/806-3915
e-mail: kley@de.tuv.com

Scope of test:	1. He leak test, in accordance with the TÜV Rheinland standard, on the sealing of the operating shaft penetration of the DN 25, 50 and 150 ball valves in new condition at room temperature and after 20,000, 40,000, 70,000 and 100,000 operating cycles at room temperature. 2. Verification of tightness after 100,000 operating cycles on the basis of VDI 2440 after ≥ 24 h, exposure to a helium pressure of 39 bar. (Definition: 1 operating cycle = motion of the operating shaft from the closed position into the open position of the sampling valve and back into the closed position)
Test equipment:	Leybold Heraeus UL 500 type
Test method:	Partial leakage rate measurement over the operating shaft penetration, switch position open. The inner chamber of the valve is filled with test gas (He 4.6) until a pressure of 39 bar is reached. Differential pressure over operating shaft: 40 bar. Operating cycles completed: 20,000 or 40,000, 70,000, 100,000 respectively
Test procedure:	1. Testing of leakage rate until a steady state is reached. Testing at room temperature. Contrary to the specifications of VDI 2440, the tests were carried out solely at room temperature. The leakage rate measurement during the switching operation was done without for the benefit of a much more stringent leakage rate requirement (not less than 10^{-8} mbar l s^{-1}). 2. As specified in VDI 2440: (permeation test)
Test result:	1. The leakage rates mesured on the operating shaft penetration of the ball valves made by Armaturenvertriebsgesellschaft Alms mbH are listed below:

No.	Nominal width	Leakage rate (as-delivered condition) mbar l s^{-1}	Number of operating cycles	Leakage rate (after operating cycles) mbar l s^{-1}
1.1	DN 20, ¾"	3.5×10^{-10}	40,000	1.1×10^{-9}
1.2	DN 20, ¾"		70,000	4.5×10^{-10}
1.3 *	DN 20, ¾"		100,000	5.3×10^{-10}
2.1	DN 50, 2"	8.5×10^{-10}	40,000	1.5×10^{-9}
2.2	DN 50, 2"		70,000	2.5×10^{-9}
2.3	DN 50, 2"		100,000	2.5×10^{-9}
3.1	DN150, 6"	5.5×10^{-10}	40,000	5.6×10^{-9}
3.2	DN150, 6"		70,000	5.8×10^{-9}
3.3	DN150, 6"		100,000	6.0×10^{-9}

* **The DN 20 valve was tested also at 200 °C (see 1.3 above); leakage rate: 5.5×10^{-10}**

TÜV Industrie Service GmbH
Project Management / In-Process and On-Site Inspection
Am Grauen Stein
51105 Köln (Poll)
Telephone: 0221/806-2957
Fax: 0221/806-3915
e-mail: kley@de.tuv.com

Test results contd.:

A) These leakage rates are within the range of guaranteed values for valves constructed to TA-Luft, Section 5.2.6.4 (bellow with downstream safety gland).

The following table shows the specific leakage rates of the sealing systems with the nominal widths listed below in relation to the length of seal of 1 meter after 100,000 operating cycles:

DN 20, ¾": 1.1 x 10^{-8} mbar l s^{-1} m^{-1} (specific leakage rate)

DN 50, 2": 3.1 x 10^{-8} mbar l s^{-1} m^{-1} (specific leakage rate)

DN150, 6": 4.9 x 10^{-8} mbar l s^{-1} m^{-1} (specific leakage rate)

2. Tests based on VDI 2440

The ball valves of Bac Valves had to undergo 100,000 operating cycles and were exposed to a helium pressure of 39 bar for 24 hours until a steady state was reached. The leakage rates obtained during these tests are listed below:

DN 20, ¾": 1.5 x 10^{-8} mbar l s^{-1}

DN 50, 2": 2.1 x 10^{-7} mbar l s^{-1}

DN150, 6": 5.8 x 10^{-7} mbar l s^{-1}

These leakage rates are lower by far than the specific leakage rate of 10^{-4} mbar l / (s m) that is required in VDI 2440.

The specific leakage rate ($Q^{PR\ soll}$) the test samples are required to reach, taking account of the average length of seal in mm, is given below:

DN 20, ¾": 50.26 mm 5.0 x 10^{-6} mbar l s^{-1} m^{-1} (specific leakage rate)

DN 50, 2": 81.68 mm 8.2 x 10^{-6} mbar l s^{-1} m^{-1} (specific leakage rate)

DN150, 6": 131.95 mm 1.3 x 10^{-5} mbar l s^{-1} m^{-1} (specific leakage rate)

The operating spindle penetrations of the valves referred to above made by Armaturenvertriebsgesellschaft Alms mbH that are covered by this certificate are consequently to be regarded as equivalent in respect of their sealing effect and satisfy the requirements of TA-Luft.

B) Also the requirement of TRB 610, Section 3.2.1.9 is fulfilled. However, the operator of the valves is required to have them checked while in use and maintained at regular intervals to guarantee their tightness.

Cologne, 28 February 2006
922-ws

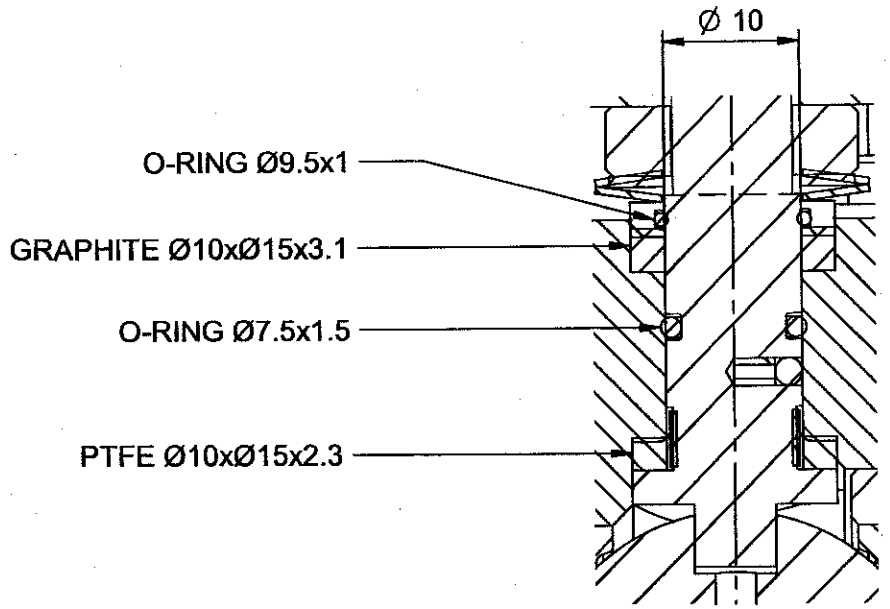
Inspector

W. Schledde

TÜV Industrie Service GmbH
Project Management / In-Process and On-Site Inspection
Am Grauen Stein
51105 Köln (Poll)
Telephone: 0221/806-2957
Fax: 0221/806-3915
e-mail: kley@de.tuv.com

BAC VALVES STUFFING BOX DESIGN

F03s

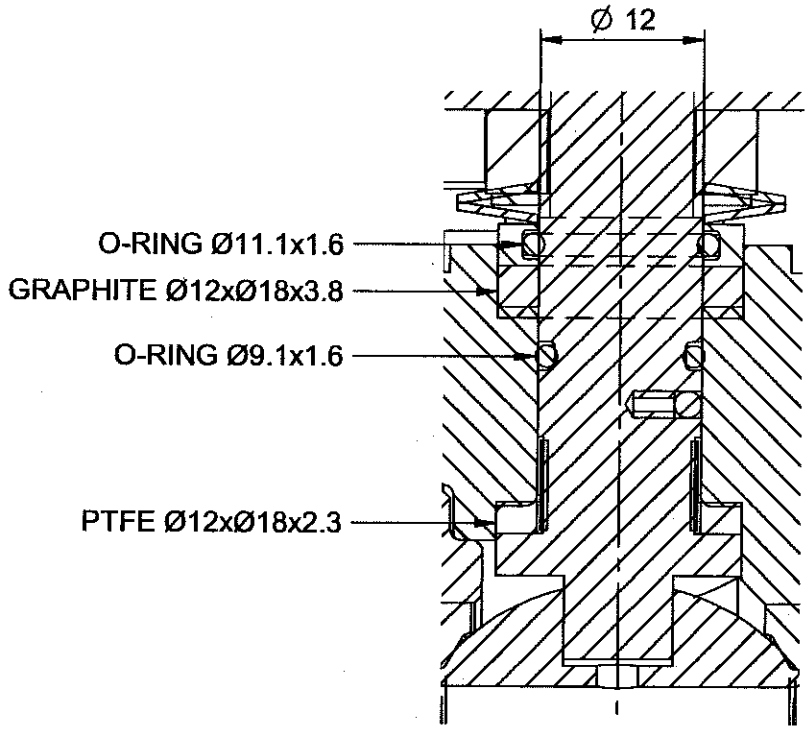


BAC VALVES

Tapis, 126 - P.O. Box, 13 - 17600 FIGUERES (Girona) Spain
Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / *Title*	Dibujado / *Drawn*	Escala / *Scale*
BALL VALVES STUFFING BOX F03s	Anna Blanch	2:1
	Aprobado / *Approved*: Anna Blanch	Fecha / *Date*: 09-07-2009
	Plano nº / *Drawing nr.*: STUFFING BOX F03s	Rev.

F03



BAC VALVES

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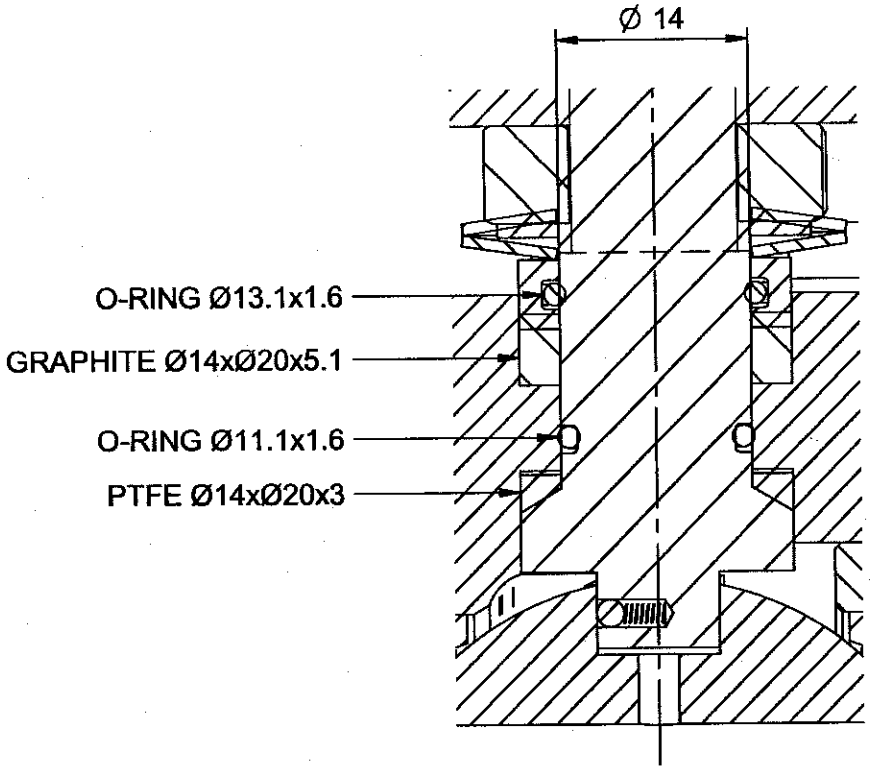
Tel.: (34) 972 67 70 52 - **Fax:** (34) 972 50 90 40
E-mail:technical@bacvalves.com **web:**www.bacvalves.com

Titulo / *Title*	Dibujado / *Drawn*	Escala / *Scale*
BALL VALVES STUFFING BOX F03	Anna Blanch	2:1
	Aprobado / *Approved* Anna Blanch	Fecha / *Date* 09-07-2009
	Plano nº / *Drawing nr.* STUFFING BOX F03	Rev.

F04



BAC VALVES

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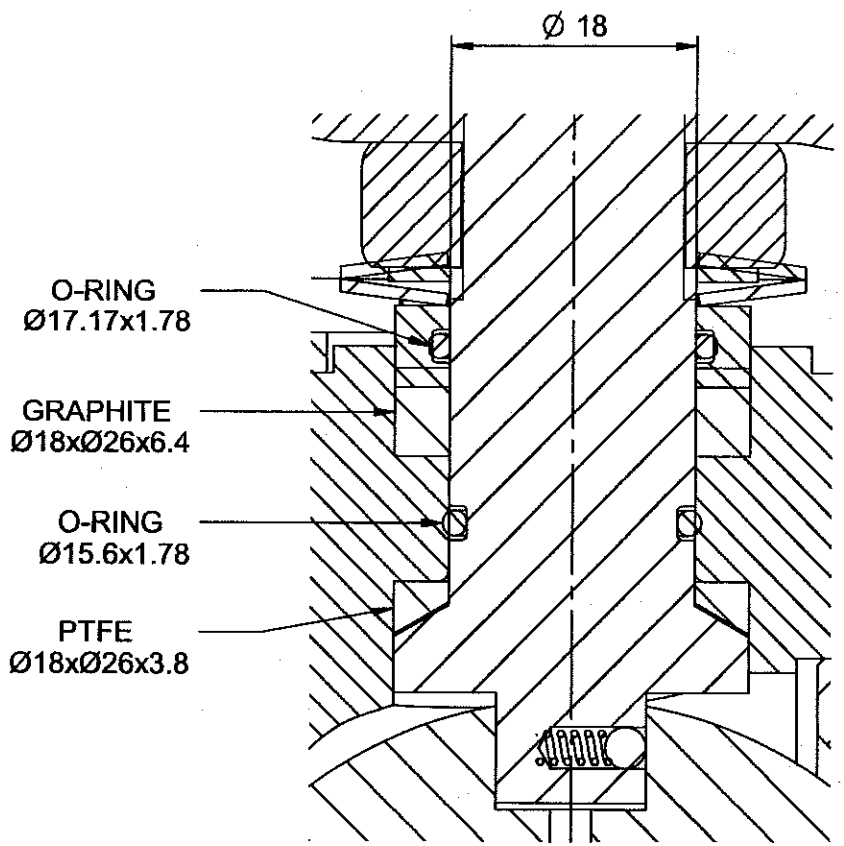
Tel.: (34) 972 67 70 52 - **Fax:** (34) 972 50 90 40
E-mail:technical@bacvalves.com **web:**www.bacvalves.com

Titulo / *Title*	**Dibujado / *Drawn*** Anna Blanch	**Escala / *Scale*** 2:1
BALL VALVES STUFFING BOX F04	**Aprobado / *Approved*** Anna Blanch	**Fecha / *Date*** 09-07-2009
	Plano nº / *Drawing nr.* STUFFING BOX F04	**Rev.**

F05



BAC VALVES

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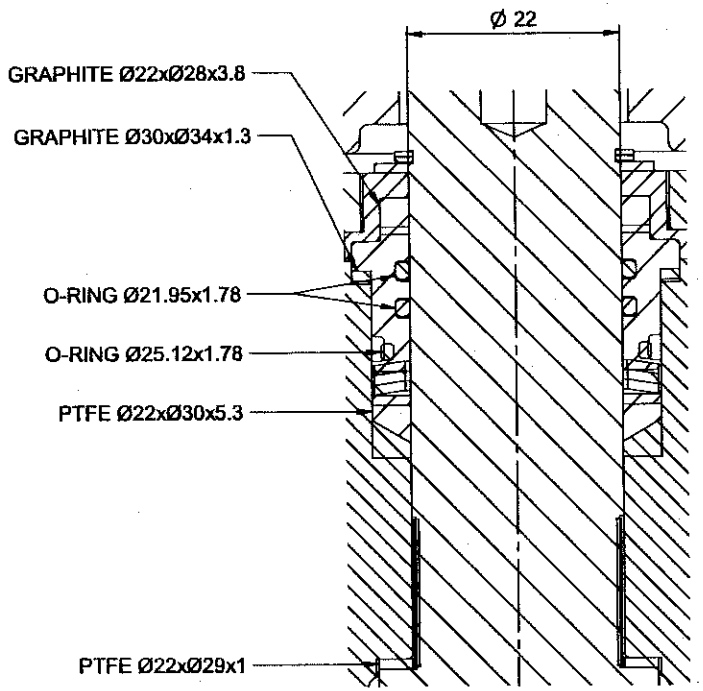
Tel.: (34) 972 67 70 52 - **Fax:** (34) 972 50 90 40
E-mail:technical@bacvalves.com **web:**www.bacvalves.com

Titulo / *Title*	**Dibujado / *Drawn*** Anna Blanch	**Escala / *Scale*** 2:1
BALL VALVES STUFFING BOX F05	**Aprobado / *Approved*** Anna Blanch	**Fecha / *Date*** 09-07-2009
	Plano nº / *Drawing nr.* STUFFING BOX F05	**Rev.**

F07



BAC VALVES

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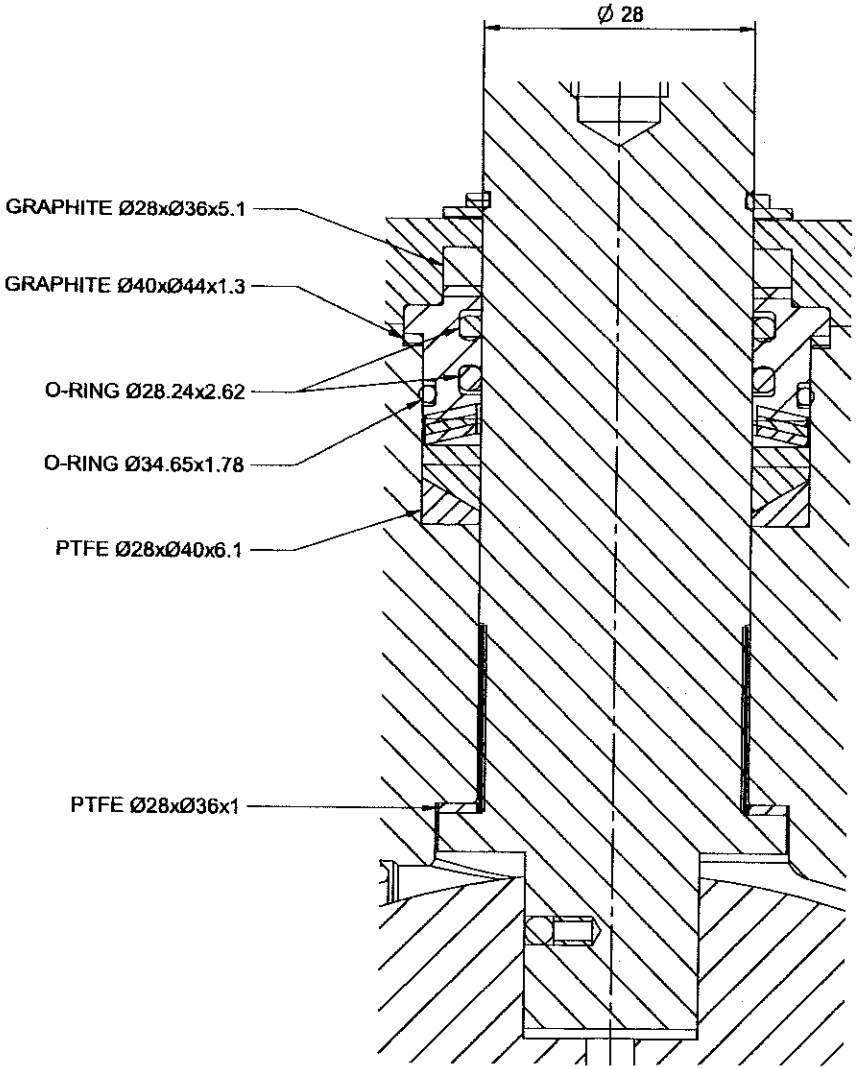
Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / Title: BALL VALVES STUFFING BOX F07	Dibujado / Drawn: Anna Blanch	Escala / Scale: 2:1
	Aprobado / Approved: Anna Blanch	Fecha / Date: 09-07-2009
	Plano nº / Drawing nr.: STUFFING BOX F07	Rev.

F10

Ø 28



BAC VALVES

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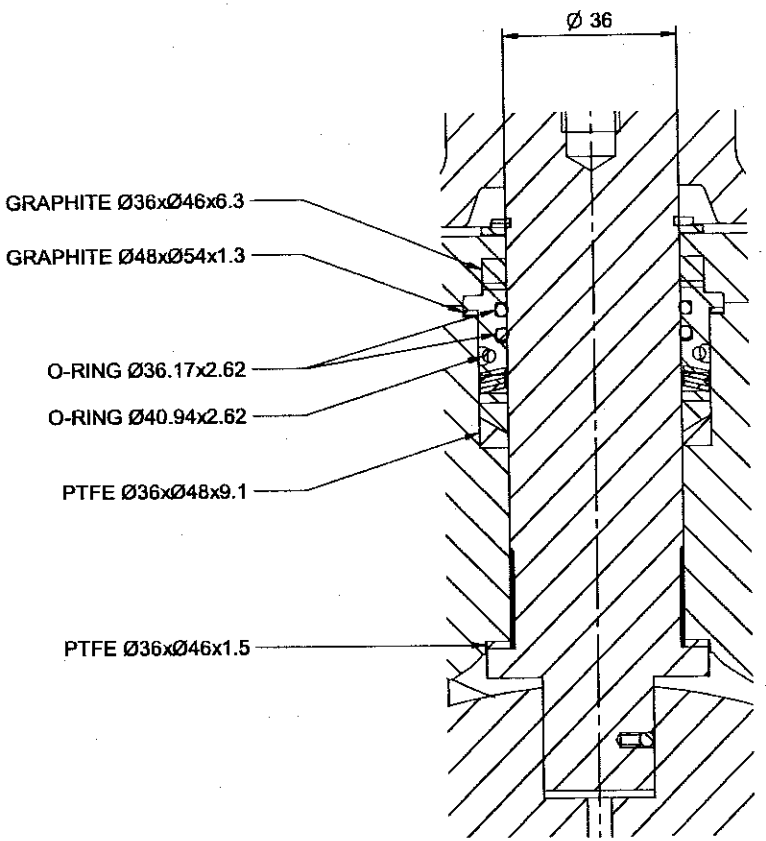
Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / Title	Dibujado / Drawn	Escala / Scale
BALL VALVES STUFFING BOX F10	Anna Blanch	2:1
	Aprobado / Approved: Anna Blanch	Fecha / Date: 09-07-2009
	Plano nº / Drawing nr.: STUFFING BOX F10	Rev.

F12

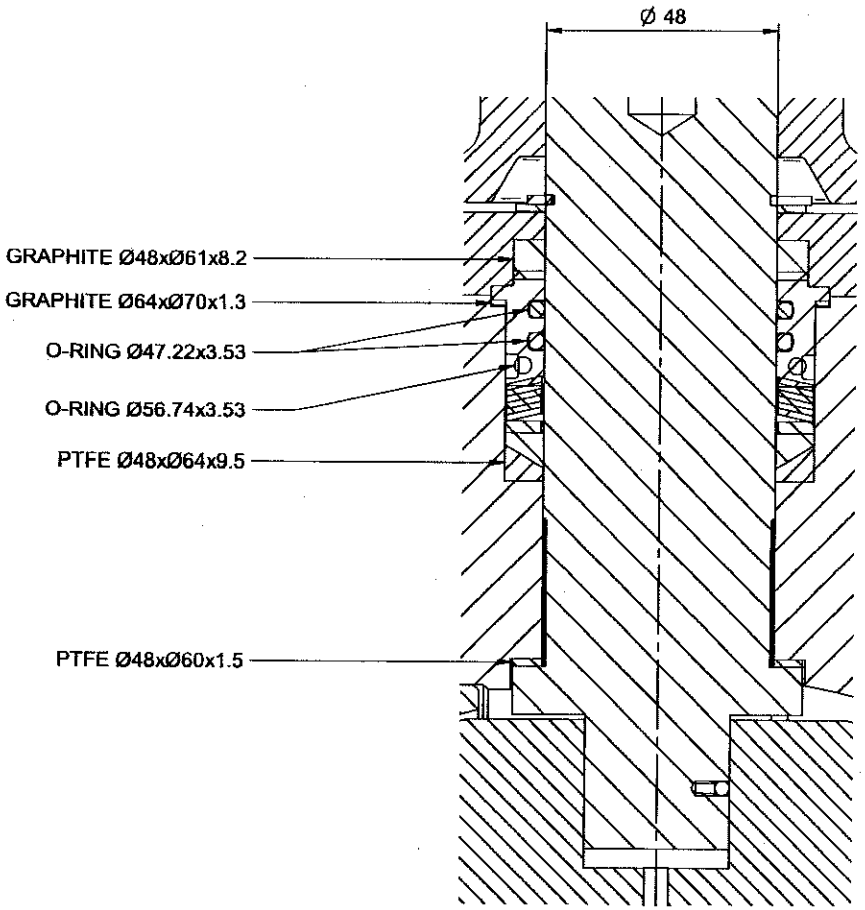


BAC VALVES

Tapis, 126 - P.O. Box, 13 - 17600 FIGUERES (Girona) Spain
Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / Title	Dibujado / Drawn	Escala / Scale
BALL VALVES STUFFING BOX F12	Anna Blanch	1:1
	Aprobado / Approved: Anna Blanch	Fecha / Date: 09-07-2009
	Plano nº / Drawing nr.: STUFFING BOX F12	Rev.

F14



BAC VALVES

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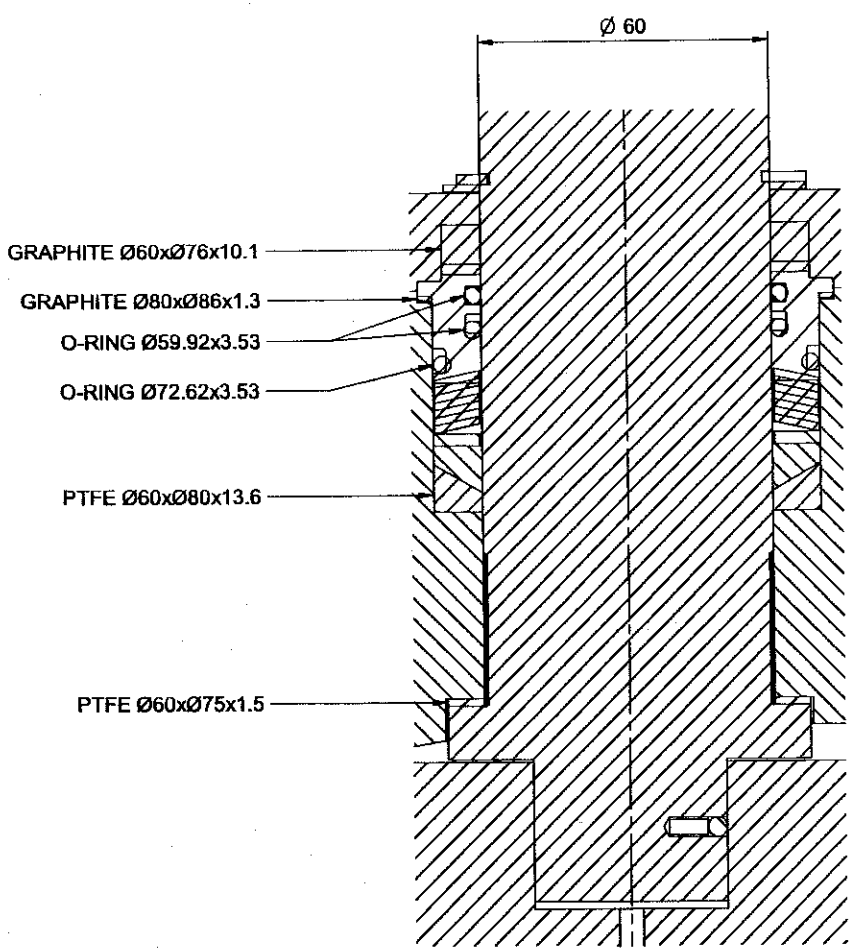
Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / Title	Dibujado / Drawn	Escala / Scale
BALL VALVES STUFFING BOX F14	Anna Blanch	1:1
	Aprobado / Approved: Anna Blanch	Fecha / Date: 09-07-2009
	Plano nº / Drawing nr.: STUFFING BOX F14	Rev.

F16



BAC VALVES

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Tel.: (34) 972 67 70 52 - Fax: (34) 972 50 90 40
E-mail:technical@bacvalves.com web:www.bacvalves.com

Título / Title	Dibujado / Drawn	Escala / Scale
BALL VALVES STUFFING BOX F16	Anna Blanch	1:1
	Aprobado / Approved: Anna Blanch	Fecha / Date: 09-07-2009
	Plano nº / Drawing nr.: STUFFING BOX F16	Rev.

2012 ELP COMPLIANCE STATUS REPORT

Consent Decree No. 1:11-cv-13330-TLL-CEB

See Corresponding Tab in the Confidential Folder for Relevant Documentation

Bonney Forge Response

Smith, Vanessa (A)

From: DeVine, Dan (DJ)
Sent: Tuesday, May 01, 2012 4:18 PM
To: Mark Slayton
Cc: Russ Christian; 'Dayries, Richard [HDS]'; DeVine, Dan (DJ)
Subject: FW: LDAR Low Fugitive Emission Questionnaire-follow up questions
Attachments: Bonney_Forge_API_622_Certificate.pdf; ATT00001.htm; ecosealfugitiveemissionstest150062410.pdf; ATT00002.htm; Pillar_BF_Eco_Seal_Packing_Cert.pdf; ATT00003.htm; Fugitive Emission Letter 50 ppm 5 Years 8-22-11.pdf; ATT00004.htm; Bonney_Forge_API_622_Certificate_FSV.PDF; ATT00005.htm; Ecosealforged312011.pdf; ATT00006.htm; Low-E Valve Questionnaire.docx; ATT00007.htm

Importance: High

Mark,
I have two follow up questions on valve fugitive emissions. Can you please help again?

1) Can you provide testing data to Dow for the globe valves identified in the questionnaire, that are listed as low emission?
2) Can you tell me what type of packing was used in the Bonney Forge gate valve, Class 800, ¾ inch, or is this proprietary?

Please let me know. If possible, I would like this information by May 8th. I look forward to seeing you and Russ on Thursday.

Thanks again,
Dan DeVine

From: Russ Christian [mailto:rchristian@columbiapipe.com]
Sent: Thursday, February 16, 2012 9:02 AM
To: DeVine, Dan (DJ)
Subject: Fwd: LDAR Low Fugitive Emission Questionnaire

Response from Bonney Forge re: LDAR questionnaire

Russ C.

Sent from my iPad

Begin forwarded message:

> **From:** "Mark Slayton" <mslayton@bonneyforge.com>
> **To:** "Russ Christian" <rchristian@columbiapipe.com>
> **Subject: Fw: LDAR Low Fugitive Emission Questionnaire**
>
> Here you go!
>
> ----- Original Message -----
> From: Steve Thomas
> To: Mark Slayton
> Cc: Paul Heald; Sandy Brumbaugh

Sent: Thu Feb 16 08:15:11 2012
Subject: RE: LDAR Low Fugitive Emission Questionnaire

Mark,
Here is the information you requested. Please forward to the appropriate person. If they have any questions, or need anything further, please have them contact me.

Regards,

Steve Thomas
VP-Valve Products & Southwest Region
Bonney Forge Corporation
713-398-8348 mobile
281-837-9986 office
800-345-7546 Mt Union

-----Original Message-----
From: Mark Slayton
Sent: Wednesday, January 04, 2012 5:14 PM
To: Steve Thomas; Paul Heald; Sandy Brumbaugh
Subject: Fw: LDAR Low Fugitive Emission Questionnaire

Hello all, I just received this from Russ at Columbia Pipe for Dow Midland. Please review and let me know when we can respond back. Thanks.

----- Original Message -----
From: Russ Christian <rchristian@columbiapipe.com>
To: 'Tony Boland' <tony.boland@velan.com>; Mark Slayton; 'Adam Ryan (aryan@coopervalves.com)' <aryan@coopervalves.com>; 'Mark Cottrell' <mcottrell@NewmansValve.com>; wayne.gallupe@metso.com <wayne.gallupe@metso.com>; 'Janet Green' <jgreen@newayvalve.com>; 'Sumit Gupta' <sumitg@larsentoubro.com>; 'jstewart@kennedyind.com' <jstewart@kennedyind.com>; 'brianm@kitz.com' <brianm@kitz.com>; Terry Thurn (tthurn@tycovalves.com) <tthurn@tycovalves.com>; Terry Thurn (tthurn@tycovalves.com) <tthurn@tycovalves.com>; 'BDiStefano@ladishvalves.com' <BDiStefano@ladishvalves.com>; 'mcoles@newdellco.com' <mcoles@newdellco.com>; 'tom.stricklen@c-a-m.com' <tom.stricklen@c-a-m.com>; 'landerschier@forberg.com' <landerschier@forberg.com>; 'rkim@swivalves.com' <rkim@swivalves.com>; 'jyonkman@lockwoodint.com' <jyonkman@lockwoodint.com>; clark.kreutzberg@midlandvf.com <clark.kreutzberg@midlandvf.com>; stmiller@flowserve.com <stmiller@flowserve.com>; 'sales-hoke@circortech.com' <sales-hoke@circortech.com>; Roger Shemberger (rscontrols@rscontrols.com) <rscontrols@rscontrols.com>; Rick Anderson (randerson@xomox.com) <randerson@xomox.com>; 'jhlee@tyvalve.co.kr' <jhlee@tyvalve.co.kr>; 'larry@fluorosealvalves.com' <larry@fluorosealvalves.com>; 'sales@douglas-chero.com' <sales@douglas-chero.com>; 'jason.legendre@f-e-t.com' <jason.legendre@f-e-t.com>; 'theo.borgemeester@bacvalves.com' <theo.borgemeester@bacvalves.com>
Cc: 'DeVine, Dan (DJ)' <devinedj@dow.com>; 'Dayries, Richard [HDS]' <Richard.Dayries@sunbeltsupply.com>; Tammy Whitmer [HDS] <tammy.whitmer@sunbeltsupply.com>
Sent: Wed Jan 04 11:01:31 2012
Subject: LDAR Low Fugitive Emission Questionnaire

To All,

Dow has requested that each of manufacturers listed on the attached excel spreadsheet fill out and return the following attached questionnaire.

The "Low-E Valve Questionnaire" will act as a record to determine if each manufacturer valves and valve design comply with EPA Method 21 and that the stem leakage is designed to be 100 ppm or less over 5 years of service.

This is all a part of Dow's LDAR program (leak detection and repair). The EPA's Consent Decree went into effect on November 23rd of 2011 for the Michigan Operations site and Dow has a limited time to meet compliance. Please fill the questionnaire to the best of your ability and with as much detail as you can provide.

The attached spreadsheet consist of two tabs that you'll reference to complete the questionnaire. The first tab is sorted by Mfg and includes the Dow CPPS number. The second tab provides a description of the Dow CPPS valve code.

I would appreciate a response that you have received this message; and please provide an estimated time for delivery of the questionnaire.

We would like a completed questionnaire no later than Friday February 17th, 2012.

Feel free to direct any questions to myself or Dan DeVine.

Regards,

Russell Christian

Regional Manager

Sunbelt / Columbia

Midland, Michigan

Ph 989-496-9260 Ext. 2001

Fx 989-496-9261

Cell 989-600-8297

As we discussed, here is the Low Fugitive Emission Questionnaire that I need to have completed. The Consent Decree went into effect on November 23rd for Michigan Operations.

If you could please assist me in collecting data, it would be greatly appreciated. (Dow has six months to get in compliance). If you can send the answers back to me I will compile the information. If we do not get responses we will need to follow up and I need to document it too.

Hopefully this will also help Sunbelt too, in case other oil or chemical companies ask for this information, if they have to deal with a Consent Decree.

There are 33 valve manufacturers, over 100 valve items codes, in the Dow pipe specifications that require this information. See attached spreadsheet. It can sorted in different ways, but I can help with that if needed. Using the first tab (called mfg) and clicking on the drop down arrows or sorting by manufacturer may be the easiest way to build a list of who all needs to be contacted.

I look forward to working with you on this. Please contact me with any questions or let me know if there is an easier way to do this or how I can help.

Thanks,

Dan DeVine
Piping DAS, Site CPPS Technical Resource, MIOPs, WVO, ECO, and Business Aligned Sites Piping Practices Technical Resource Leader Engineering Solutions The Dow Chemical Company 1400 Building, Michigan Operations Midland, MI 48640 phone 989-636-4330 Fax 989-638-3929
email: devinedj@dow.com

LOW FUGITIVE EMISSION VALVE AND PACKING QUESTIONNAIRE

Two production units at The Dow Chemical Company **Michigan Operations Site** recently came under a Consent Decree from the EPA. One part of this Consent Decree requires installation of Low Fugitive Emission valves and/or Low Fugitive Emission valve stem packing that meets the definition shown below. It also requires supporting documentation.

"Low-Emissions Valve" or "Low-E Valve" shall mean either (i) or (ii) as follows:

(i) A valve (including its specific packing assembly) for which the manufacturer has issued a written warranty that it will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the valve; provided however, that no valve shall qualify as "Low-E" by reason of written warranty unless the valve (including its specific packing assembly) either:

(a) first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty; or

(b) is as an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

Or

(ii) A valve (including its specific packing assembly) that:

a. Has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and that, during the test, at no time leaked at greater than 500 ppm, and on average, leaked at less than 100 ppm; or

b. Is an Extension of another valve that qualified as "Low-E" per the definition of "Extension" listed below.

NOTE: "Extension" shall mean that: (i) the tested and untested valves were produced by the same manufacturer to the same or essentially equivalent quality requirements; (ii) the characteristics of the valve that affect sealing performance (e.g., type of valve, stem motion, tolerances, surface finishes, loading arrangement, and stem and body seal material, design, and construction) are the same or essentially equivalent as between the tested valve and the untested valve; and (iii) the temperature and pressure ratings of the tested valve are at least as high as the temperature and pressure ratings of the untested valve.

Therefore can you please answer **ALL** of the following questions regarding valves that could be supplied to The Dow Chemical Company, Michigan Operations Site?

COMPANY NAME: _____Bonney Forge Corp_____

1) Will your company provide a written warranty for low emission valves as defined above?
   YES or NO? yes

   If YES, please describe the testing (the nature of the test and the resulting data) that supports the warranty.
   Out valves have been tested by United Valve to API622 and our packing has been tested to API622
   OR

2) Does your company produce valves that have been proven through testing to meet the emission limits in the definition for low emission valves? YES or NO

If yes to the above questions, what size and type of valves that your company produces will meet this definition or warranty? Please be specific as possible (i.e. which series of valves or models numbers).

Ball?

Plug?

Gate? ½" thru 3" API 602 and 2" thru 36" API 600

Globe? ½" thru 2" API 602 and 2" thru 12" API 600

Butterfly?

Other?

3) Which valves, including sizes, were tested?

   ¾" 800# gate A105 and 4" 300# gate WCB

4) Which valves, including sizes, are qualified per an extension?
   Bonney Forge valves are only produced by Bonney Forge facilities.

5) Will you provide the test data to The Dow Chemical Company for review? If yes, please include it in the response.
   YES

6) Does your Company offer a valve with low emission packing per the following definition?

"Low-Emissions Packing" or "Low-E Packing" shall mean either (i) or (ii) as follows:

(i) A valve packing product, independent of any specific valve, for which the manufacturer has issued a written warranty that the packing will not emit fugitives at greater than 100 ppm, and that, if it does so emit at any time in the first five years, the manufacturer will replace the product; provided however, that no packing product shall qualify as "Low-E" by reason of written warranty unless the packing first was tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions and the results of the testing reasonably support the warranty;

Or

(ii) A valve packing product, independent of any specific valve that has been tested by the manufacturer or a qualified testing firm pursuant to generally-accepted good engineering practices for testing fugitive emissions, and that, during the test, at no time leaked at greater than 500 ppm, and on average leaked at less than 100 ppm.

7) If yes, for which valves would "Low-E Packing" be offered?

Bonney Forge uses a proprietary packing in all of our valve products

8) For which types of packing is "Low-E" status based on a written warranty?

All Bonney Forge valves are covered by our written warranty

9) For which types of packing is "Low-E" status based on testing that shows the packing meets the emission limits in the definition above?

10) If yes, can this Low-E Packing testing information be provided to The Dow Chemical Company for review? If yes, please include it with the response.

Thank you for your assistance to help meet low emission compliance.

Please contact Dan DeVine at 989-636-4330, or by email at devinedj@dow.com with questions or clarifications.

United Valve
The Valve Service Specialists

CERTIFICATE

This is to certify that the Bonney Forge Eco Seal test packing has been tested in accordance with API 622 Second Edition. The valve was subjected to fifteen hundred and ten cycles total, consisting of five ambient and five thermal temperature ranges. The valve packing measured less than 100 ppm throughout the duration of the test with no packing adjustments. The data recorded was signed off and found to be in compliance with the maximum allowable leakage rates per API 622 Second Edition Fugitive Emissions standards.

MANUFACTURER:	Nippon Pillar™
LOCATION:	Osaka, Japan
CUSTOMER:	Bonney Forge
EQUIPMENT:	Bonney Forge Eco Seal - 4" 300# Gate Valve
TEST DATE:	June 11th, 2010 through June 24th, 2010

Nick Lucas
Project Manager
United Valve

9916 Gulf Freeway, Houston, TX 77034
(713) 944-9852, fax (713) 944-5964

Physical Properties.

Bonney Forge Eco Seal	End Ring	Seal Ring
Supplier Graphite	TOYO TANSO SGL CARBON	TOYO TANSO SGL CARBON
Density (g/cm3)	1.8~1.9	1.55~1.65
Max. Press.	440kgf/cm2 (ANSI 2500LB)	440kgf/cm2 (ANSI 2500LB)
Max. Temp. Steam (℃)	-200 ~ +650	-200 ~ +650
Max. Temp. Oxyd ENV. (℃)	-200 ~ +450	-200 ~ +450
Max. Temp. Non-Oxyd (℃)	-200 ~ +3000	-200 ~ +3000
Purity	99 %	99.5 %
ASH Content	Max. 1% (Raw Material)	Max. 0.5% (Raw Material)
Anti Oxidant	Phosphorus	Phosphorus
Corrosion Inhibitor	NaOh	Anti corrosive oil
% Leachable Chloride(PPM)	Max. 50ppm (Raw Material)	Max. 50ppm (Raw Material)
Total Fluoride(PPM)	Max. 300ppm (Raw Material)	Max. 300ppm (Raw Material)
Total Halogen(PPM)		
Ttoal Sulfur(PPM)	Max. 500ppm (Raw Material)	Max. 500ppm (Raw Material)
Sulfur as SO2(PPM)	Max. 200ppm (Raw Material)	Max. 200ppm (Raw Material)

NIPPON PILLAR PACKING CO., LTD

United Valve
The Valve Service Specialists

CERTIFICATE

This is to certify that the Bonney Forge Eco Seal test packing has been tested in accordance with API 622 Second Edition. The valve was subjected to twelve hundred fifty cycles total, consisting of five ambient and five thermal temperature ranges. The valve packing measured less than 100 ppm throughout the duration of the test with no packing adjustments. The data recorded was signed off and found to be in compliance with the maximum allowable leakage rates per API 622 Second Edition Fugitive Emissions standards.

MANUFACTURER:	Nippon Pillar™
LOCATION:	Osaka, Japan
CUSTOMER:	Bonney Forge
EQUIPMENT:	Bonney Forge Eco Seal - 3/4" 800# Gate FSV
TEST DATE:	February 22, 2011 through March 1, 2011

Nick Lucas
Project Manager
United Valve

9916 Gulf Freeway, Houston, TX 77034
(713) 944-9852, fax (713) 944-5964

BONNEY FORGE

U.S. ROUTE 522 SOUTH
P.O. BOX 330
MOUNT UNION PA. 17066-0330
(800) 345-7546 • (814) 542-2545
(814) 542-3305 FAX

Subject: Fugitive Emission Compliance for Bonney Forge Valve Products

Bonney Forge has completed and does on-going Fugitive Emission testing of both our Forged Steel Valve and Cast Steel Valve product lines. As a result of this testing, we can currently certify that our valves meet the following leakage rates when shipped from our facility:

Forged and Cast Steel Valves = 50 ppmv

A guarantee of Fugitive Emission rates after a valve has been put into service is not practical. Leakage is dependent on service application, frequency of valve cycling, and proper maintenance of the valve while in service. Bonney Forge has completed thermal and high cycle emission testing of our valve products in a laboratory environment. This testing to API 622 Second Edition has shown that both our Forged and Cast Steel Valve products at 50 PPMV maximum leakage rates can be maintained after 5 thermal cycles using Bonney Forge standard low emissions valve packing. However, this testing was completed in a controlled environment where the service was clean methane gas, the valve yoke area was properly lubricated, and the valve stem did not require cleaning, all during the entire test duration. Maintenance procedures are not necessarily performed on a regular basis on valves installed in the field.

Therefore, Bonney Forge cannot guarantee Fugitive Emission rates for a 5 year period or beyond our standard warranty. Our standard warranty is for one (1) year after installation. We will however work with the end user on a Fugitive Emission solution that is reasonable and acceptable to all involved. Bonney Forge, along with NPCA, has developed a proprietary packing for all our standard valve products that reached the emission levels stated above. If a failure is detected, Bonney Forge will be glad to provide our Eco-Seal® packing to you for installation in the field that has reduced installation steps compared to typical packing.

Please feel free to contact me, or Paul Heald-VP Product Engineering, if you should have any questions on the information presented above or would like to discuss this information in more detail.

Best Regards,

Steve Thomas
Vice President – Valve Products
Bonney Forge Corporation

2012 ELP COMPLIANCE STATUS REPORT

Consent Decree No. 1:11-cv-13330-TLL-CEB

See Corresponding Tab in the Confidential Folder for Relevant Documentation

API Standard 622 Test Report

"Type Testing of Process Valve Packing for Fugitive Emissions"
Second Edition, 2011

Performed for

A.W. Chesterton

www.chesterton.com

Style 1622 Braided Graphite Packing

Project Number: 211211
Test Start Date: April 5, 2012

Performed by

YARMOUTH RESEARCH AND TECHNOLOGY, LLC

434 Walnut Hill Road
North Yarmouth, ME 04097 USA
(207) 829-5359
info@yarmouthresearch.com
www.yarmouthresearch.com

Yarmouth Research and Technology, LLC

API 622 PROJECT SUMMARY

Customer:	A. W. Chesterton	**Start Date:**	5-Apr-12
		Project #:	211211

Packing Information

Packing Description:	A. W. Chesterton Style 1622	
	Rings cut from spool and installed by Chesterton	
	Test conducted in test fixture.(1)	
Source of Sample:	Customer	
Packing Cross Section:	1/4 inch	nominal
Packing Free Ht:	1.44	inches - measured

Test Conditions

Specification:	API 622, 2nd Edition, 2011			
Test Media:	99% Methane	**Test Pressure:**	600	psig
Recommended Packing Nut Torque:		40	ft-lb	
Maximum Allowable Leakage:		100	PPMv	
Stem Linear Travel During Cycling:		4.0	inches	
Cycling Rate:		45	seconds per cycle	

Dimensions (inches)

Stem Diameter:	1.000	**Bore Diameter:**	1.500
Follower Height:	1.059	**Bore Depth:**	1.365
Gland Ht at Start:	0.748	**% Compression:**	27%
Gland Ht at End:	0.748	**% Compression:**	27%
Gland Bolt Diameter:	5/8		

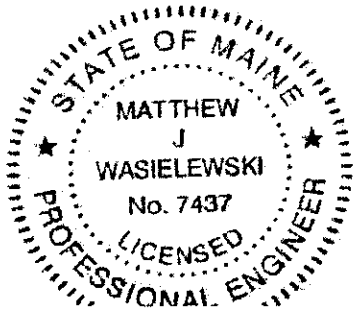
Results

Average Test Pressure:	600	psig
Number of Mechanical Cycles Completed:	1510	
Number of Thermal Cycles Completed:	5	
Number of Packing Adjustments Required:	0	
Cycle Number(s) of Packing Adjustments:	n/a	
Average Leakage Throughout Test:	16	PPMv
Maximum Leakage Throughout Test:	34	PPMv

Witness

Matthew J Wasielewski, PE

President, Yarmouth Research



Yarmouth Research and Technology, LLC

Customer: A. W. Chesterton **Start Date:** 5-Apr-12

Project #: 211211

Packing Description: A. W. Chesterton Style 1622

Rings cut from spool and installed by Chesterton

Cycle Number	*Inside Temp (F)*	*Bonnet Temp - (F)*	*Pressure (psig)*	*Stem Seal Leakage (PPMv)*		*Packing Retorque See Note*
				Avg.	*Max.*	
0	72	71	600	0	1	
50	73	84	600	5	5	
100	77	85	600	11	11	
150	79	87	600	15	16	
150	491	499	600	15	22	
200	500	497	600	16	16	
250	500	496	600	16	17	
300	501	496	600	16	16	
300	91	81	600	4	4	
350	83	83	600	5	5	
400	85	91	600	5	5	
450	85	86	600	8	9	
450	498	486	600	8	8	
500	499	490	600	8	8	
550	500	496	600	14	14	
600	499	498	600	11	11	
600	90	81	600	10	10	
650	78	78	600	16	17	
700	81	85	600	18	18	
750	83	87	600	15	15	
750	500	497	600	13	13	
800	500	495	600	17	17	
850	499	498	600	18	18	
900	497	490	600	19	19	
900	75	72	600	10	11	
950	76	79	600	27	27	
1000	79	84	600	33	34	
1050	82	86	600	33	33	
1050	500	491	600	19	19	
1100	498	495	600	16	16	
1150	501	494	600	19	20	
1200	500	491	600	20	20	
1200	93	83	600	10	10	
1250	86	90	600	21	21	
1300	87	91	600	25	26	

Yarmouth Research and Technology, LLC

1350	86	89	600	24	25	
1350	490	499	600	22	23	
1400	499	494	600	17	17	
1450	500	497	600	15	15	
1500	501	495	600	17	17	
1500	85	82	600	17	17	
1510	79	83	600	33	34	
		Averages ->	**600**	**16**	**16**	
		Maximums ->	**600**	**33**	**34**	

Packing Retorque Notes:

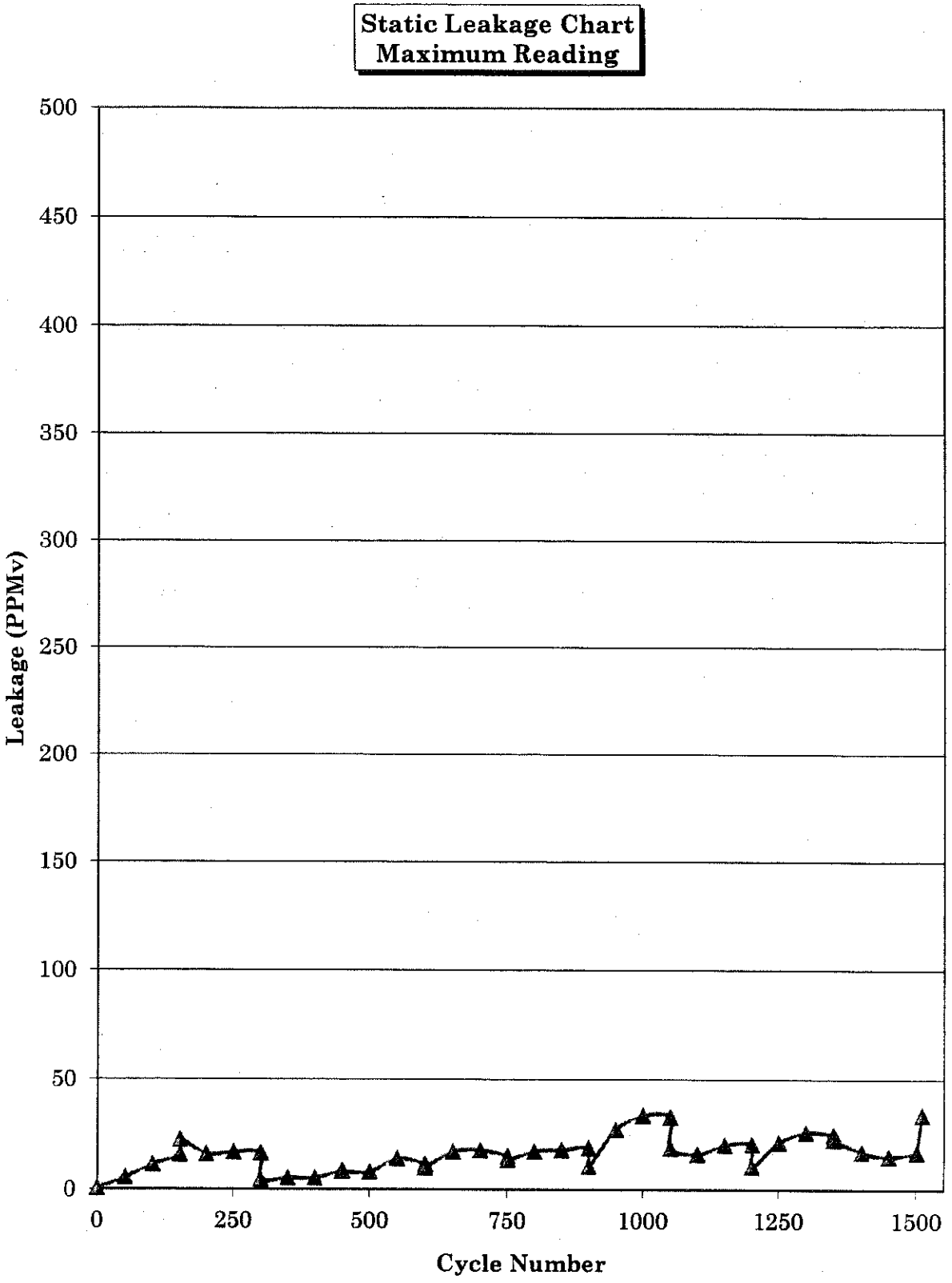
	Before Adjustment		*After Adjustment*			
	Nut Torque		*Nut Torque*		*Number of Flats*	*Gland Height*
	Side 1	*Side 2*	*Side 1*	*Side 2*		
1						
2						

Nut Torque at End of Test: (ft-lb)	30	*<-Side 1*	40	*<-Side 2*

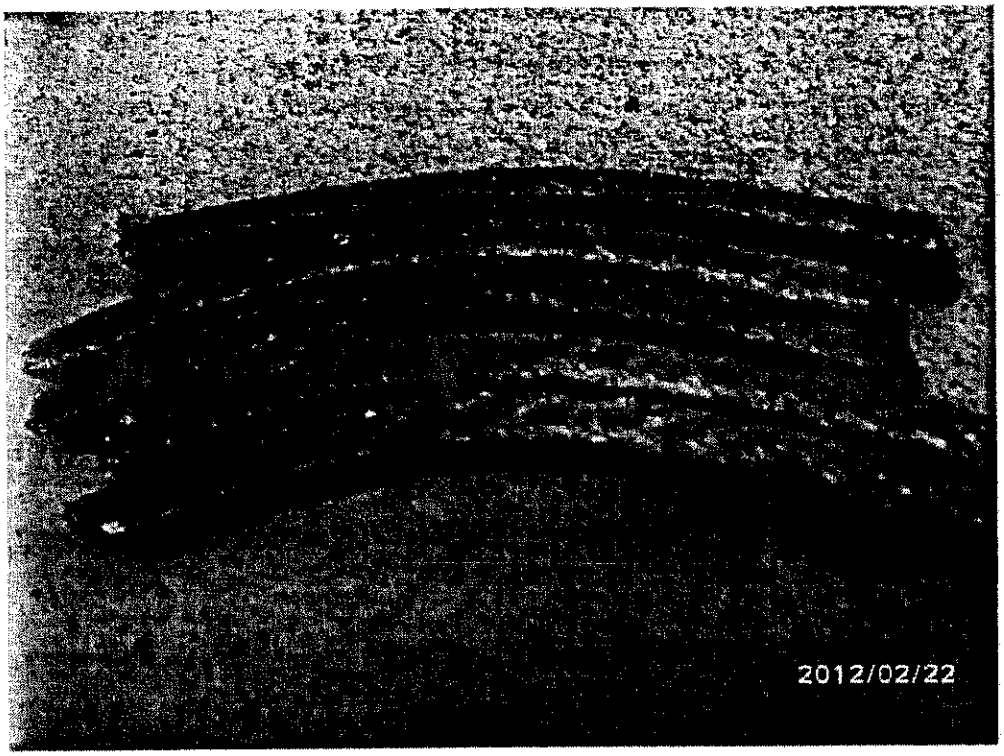
Test Notes:

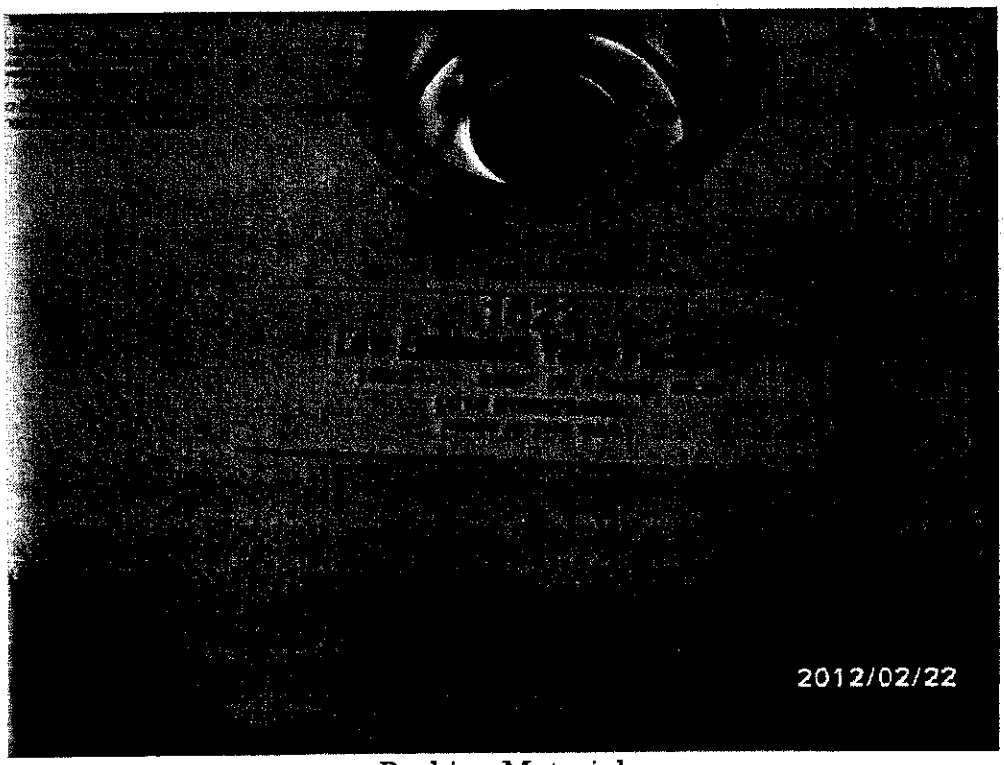
Test Results: The average and maximum leakage results shown below were calculated from 60 readings measured during a minute duration. *See data sheets for more detailed information.*

Yarmouth Research and Technology, LLC



PHOTOGRAPHS





Packing Material

CHESTERTON
Global Solutions, Local Service.

Low E Valve Packing Emissions Warranty

Static (Block or On-off) Valves:

1. Packing Style: 1622 - Low E Block Valve Packing
2. Chesterton warrants valve packing style 1622 installed in accordance to the "Conditions of Warranty" will not emit greater than 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If emissions above 100 ppm are detected and it can be demonstrated the "Conditions of the Warranty" have been met, a replacement set of packing will be provided at no cost.
3. Conditions not to exceed 1200 psig (80 bar g) and/or 600 ^{0}F (315 ^{0}C).

Control Valves:

1. Packing Style 1724E with Chesterton Live Loading
2. Chesterton warrants that the valve packing system 1724E and Live Loading in accordance to the "Conditions of Warranty" shall not emit in excess of 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If emissons above 100ppm are detected and it can be demonstrated the "Conditions of the Warranty" have been met, a replacement set of packing will be provided at no cost.
3. Conditions not to exceed 450 psig (30 bar g) and/or 400 ^{0}F (200 ^{0}C).

Conditions of Warranty

1. Stem finish should be 10 to 32 RMS (Root Mean Square) (7.5 to 24 Roughness average).
2. Stuffing box bore should be 32 to 125 RMS (Root Mean Square) (24 to 94 Roughness average).
3. Warranty applies to valves with conventional cylindrical style stuffing boxes and gland followers that allow the use of compression packing, axially loaded using an adjustable mechanically loaded gland follower.
4. Valve stem should be free of corrosion, pitting and longitudinal scoring.
5. Prior to installation the packing gland must be free from corrosion such that it fits freely into the stuffing box without restriction.
6. Stem run out must be checked and fall within the following parameter. The Stem run out should not exceed ± .010 TIR/FT (Total Indicator Runout in inches per foot) (0, 25 TIR/M or Total Indicator Runout in millimeters per meter).
7. Bottom of packing gland must be flat. No angle greater than 5°.
8. Bottom of stuffing box must be flat. No angle greater than 5°.
9. Only valves packed with 5 rings or 6 rings of 1622 or 5 rings of 1724E with Live Load shall be included. Bushing may be used to fill the remainder of stuffing box depth when the depth exceeds the length of the installed packing set.
10. At installation valve stems shall be free from scoring, erosion or any burrs, which leave metal, or other materials protruding above its original machined diameter.
11. Packing shall be installed by an authorized installer in accordance with Chesterton's published installation instructions.
12. Authorized installers of the Chesterton sealing systems will have satisfactorily completed a Chesterton valve packing installation training course and received a Certificate of Completion. Chesterton will maintain Certificate records.
13. Upon installation of the packing, the following information will be documented and sent to Chesterton:
    - Installation Date
    - Valve Identification Number
    - Packing Type
    - Initial Compression (inches)
    - Torque Measurement (ft-lbs) of the packing gland nuts.
    - Authorized Installer Name
14. Prior to issuing a replacement set of packing, Chesterton would like the opportunity to inspect the valve, packing material, and emission records of the valve at the earliest mutually agreed upon time. In the event of an emergency or timing for inspection is not feasible prior to the valve returning to service, the packing material removed will be saved. Packing to be held at Dow for inspection. Notification and emission records of the valve will be sent to Chesterton for evaluation.
15. Dow Chemical will make determination if packing is chemically compatible with the process being sealed.
16. Valves with active lantern rings are excluded from this warranty.
17. Chesterton does not warrant modulating control valves packed with style 1622.
18. Warranty applies to one replacement packing set per valve which includes 5/6 rings of 1622 for block valves or a 1724E set for a control valve

LIMITATIONS OF LIABILITY

Chesterton's obligation under this warranty is expressly limited to replacing packing material. In no event will Chesterton be liable for damage or loss to persons or property, or consequential damages which follow a failure.

CHESTERTON
Global Solutions, Local Service.

Low E Valve Packing Emissions Warranty

Static (Block or On-off) Valves:

1. Packing Style: 1622 Low E Block Valve Packing
2. Chesterton warrants valve packing style 1622 installed in accordance to the "Conditions of Warranty" will not leak greater than 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If leak rates above 100 ppm are detected and it can demonstrate the "Conditions of the Warranty have been met, a replacement set of packing will be provided at no cost. If service conditions exceed 1200 psig (80 bar g) and/or 600 ^{0}F (315 ^{0}C) shall contact Chesterton engineering for approval.

Control Valves:

1. Packing Style 1724E with Live Loading
2. Chesterton warrants that the valve packing system 1724E and Live Loading in accordance to the "Conditions of Warranty" shall not leak in excess of 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If leak rates above 100ppm are detected and Dow can demonstrate the "Conditions of the Warranty have been met, a replacement set of packing will be provided at no cost. If service conditions exceed 450 psig (30 bar g) and/or 400 ^{0}F (200 ^{0}C) shall contact Chesterton engineering for approval.

Conditions of Warranty

1. Stem finish should be 10 to 32 RMS (7.5 to 24 Ra).
2. Stuffing box bore should be 32 to 125 RMS (24 to 94 Ra).
3. Warranty applies to valves with conventional style stuffing boxes and gland followers.
4. Valve stem should be free of corrosion, pitting and longitudinal scoring.
5. The packing gland must be free from corrosion such that it fits freely into the stuffing box without restriction.
6. If a bent stem is suspected, stem run out must be checked and fall within the following parameter. The Stem run out should not exceed ± .010 TIR/FT (0, 25 TIR/M).
7. Bottom of packing gland must be flat. No angle greater than 5°.
8. Bottom of stuffing box must be flat. No angle greater than 5°.
9. Only valves packed with 5 rings or 6 rings of 1622 or 5 rings of 1724E shall be included.
10. Valve stems which have scoring, erosion or any burrs, which leave metal, or other materials protruding above its original machined diameter are excluded.
11. Warranty only applies if leakage is detected above 100 ppm and after readjustments to increase torque values, by as much as 20%, in 5% increments, have been made and leakage detection remains above 100 ppm.
12. Packing shall be installed by an authorized installer in accordance with Chesterton's published installation instructions.
13. Authorized installers of the Chesterton sealing systems will have satisfactorily completed a Chesterton valve packing installation training course and received a Certificate of Completion.
14. Upon installation of the packing, the valve must be tagged with the following information
    a. Installation Date
    b. Valve ID
    c. Packing Type
    d. Initial Compression (inches)
    e. Torque Measurement (ft-lbs)
    f. Authorized Installer Name
15. Chesterton must be given a reasonable opportunity to inspect the valve and packing material prior to repair or replacement.
16. Warranty based upon the satisfactory compatibility of graphite or PTFE with the process being sealed.
17. Valves with active lantern rings are excluded from this warranty.
18. Chesterton does not warrant modulating control valves packed with style 1622.
19. Warranty applies to one replacement packing set per valve.

LIMITATIONS OF LIABILITY

Chesterton's obligation under this warranty is expressly limited to replacing packing material. In no event will Chesterton be liable for damage or loss to persons or property, or consequential damages which follow a failure.

CHESTERTON
Global Solutions, Local Service.

Low E Valve Packing Emissions Warranty

Static (Block or On-off) Valves:

1. Packing Style: 1622 - Low E Block Valve Packing
2. Chesterton warrants valve packing style 1622 installed in accordance to the "Conditions of Warranty" will not leak greater than 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If leak rates above 100 ppm are detected and it can be demonstrated the "Conditions of the Warranty" have been met, a replacement set of packing will be provided at no cost.
3. For service conditions exceeding 1200 psig (80 bar g) and/or 600 ^{0}F (315 ^{0}C) contact Chesterton Engineering for approval.

Control Valves:

1. Packing Style 1724E with Chesterton Live Loading
2. Chesterton warrants that the valve packing system 1724E and Live Loading in accordance to the "Conditions of Warranty" shall not leak in excess of 100 PPM above background, as detected pursuant to EPA Method 21, for a period of five (5) years from the date of installation. If leak rates above 100ppm are detected and it can be demonstrated the "Conditions of the Warranty" have been met, a replacement set of packing will be provided at no cost.
3. For service conditions exceeding450 psig (30 bar g) and/or 400 ^{0}F (200 ^{0}C) contact Chesterton Engineering for approval.

Conditions of Warranty

1. Stem finish should be 10 to 32 RMS (Root Mean Square) (7.5 to 24 Roughness average).
2. Stuffing box bore should be 32 to 125 RMS (Root Mean Square) (24 to 94 Roughness average).
3. Warranty applies to valves with conventional cylindrical style stuffing boxes and gland followers that allow the use of compression packing, axially loaded using an adjustable mechanically loaded gland follower.
4. Valve stem should be free of corrosion, pitting and longitudinal scoring.
5. Prior to installation the packing gland must be free from corrosion such that it fits freely into the stuffing box without restriction.
6. If a bent stem is suspected, stem run out must be checked and fall within the following parameter. The Stem run out should not exceed ± .010 TIR/FT (Total Indicator Runout in inches per foot) (0, 25 TIR/M or Total Indicator Runout in millimeters per meter).
7. Bottom of packing gland must be flat. No angle greater than 5°.
8. Bottom of stuffing box must be flat. No angle greater than 5°.
9. Only valves packed with 5 rings or 6 rings of 1622 or 5 rings of 1724E with Live Load shall be included. Bushing may be used to fill the remainder of stuffing box depth when the depth exceeds the length of the installed packing set. Stuffing boxes using less than 5 rings of packing need to be reviewed with Chesterton Engineering.
10. At installation valve stems shall be free from scoring, erosion or any burrs, which leave metal, or other materials protruding above its original machined diameter.
11. Warranty only applies if leakage is detected above 100 ppm and after first attempt at repair as referenced in 40CFR 61.242-7(e)(3), (Tightening of packing gland nuts) to increase torque values, by as much as 20%, in 5% increments, have been made and leakage detection remains above 100 ppm.
12. Packing shall be installed by an authorized installer in accordance with Chesterton's published installation instructions.
13. Authorized installers of the Chesterton sealing systems will have satisfactorily complete a Chesterton valve packing installation training course and receive a Certificate of Completion. Chesterton will maintain Certificate records.
14. Upon installation of the packing, the following information will be documented and sent to Chesterton:
    - Installation Date
    - Valve Identification Number
    - Packing Type
    - Initial Compression (inches)
    - Torque Measurement (ft-lbs)
    - Authorized Installer Name
15. Prior to issuing a replacement set of packing, Chesterton would like the opportunity to inspect the valve, packing material, and emission records of the valve at the earliest mutually agreed upon time. In the event of an emergency or timing for inspection is not feasible prior to the valve returning to service, the packing material removed will be saved and sent to Chesterton along with emission records of the valve for evaluation.
16. Warranty is based upon the satisfactory compatibility of graphite or PTFE with the process being sealed.
17. Valves with active lantern rings are excluded from this warranty.
18. Chesterton does not warrant modulating control valves packed with style 1622.
19. Warranty applies to one replacement packing set per valve which includes 5/6 rings of 1622 for block valves or a 1724E set for a control valve

LIMITATIONS OF LIABILITY

.iesterton's obligation under this warranty is expressly limited to replacing packing material. In no event will Chesterton be liable for damage or loss to persons or property, or consequential damages which follow a failure.

1622
EMISSIONS VALVE PACKING

EQUIPMENT PREPARATION

PRECAUTION:
Observe all plant and equipment manufacturer's depressurizing and cooling procedures before installation. Review all instructions before proceeding with installation.

Preparation

1. Clean the stuffing box and stem to ensure that they are completely free of wear, solids or corrosion.
2. Determine the packing **C**ross-section: **C = [A – B] ÷ 2** (Figure 1).
3. Measure the following equipment dimensions: **D** = Stuffing Box **D**epth; **G** = **G**land Nose Length (Figure 1).
4. Determine the Number of Packing Rings: **N = (D – Stuffing Box Chamfer) ÷ C**. Round down to the nearest whole number.
5. If less than 4 rings of packing are required, contact Mechanical Packing Engineering. If 4 or 5 rings are required, calculate the required Compression Value as CV = C x N x 0.3 and proceed to step 7. If 6 or more rings are required, Calculate the Compression Value as CV = C x 5 x 0.3 and continue to step 6.
6. To determine bushing requirements, perform the following:
   a. Calculate Required Gland Nose Penetration: **GNP = D – (C x 5)**.
   b. If **(CV + GNP) x 1.5 < G**, then no bushing is required. If **(CV + GNP) x 1.5 > G**, then a bushing is required.
   c. The bushing height should be set by the following rule: **1.5 x C ≤ Bushing Height < GNP – Stuffing Box Chamfer**.
   d. If the **Calculated Bushing Height < 1.5 x C, *do not use a bushing***. Install a 6th packing ring and recalculate the **C**ompression **V**alue (Step 5) as **CV = C x 6 x 0.3**, or contact Mechanical Packing Engineering.
7. Skive cut individual packing rings:
   a. Wrap packing around a mandrel (of same diameter, B, from Figure 1); mark one ring; remove packing from mandrel and cut at 45° (Figure 2).
   b. Check first ring for fit on the mandrel.
   c. Use the first cut ring as a template and cut remaining required rings; check each ring for fit on the mandrel.

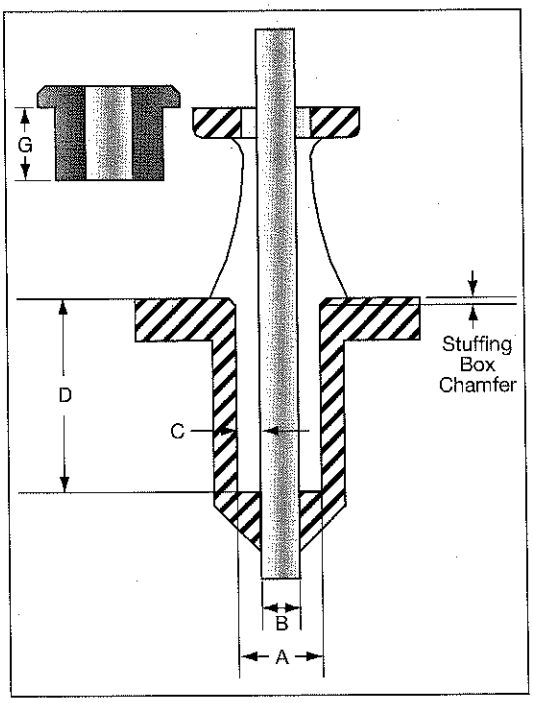


Figure 1

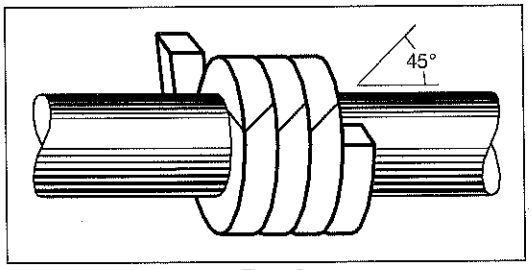


Figure 2

CAUTIONS

These instructions are general in nature. It is assumed that the installer is familiar with mechanical packing and with the plant requirements for the successful use of mechanical packing. If in doubt, get assistance from someone in the plant that is familiar with the product, or delay the installation until a packing representative is available. All necessary auxiliary arrangements for successful operation (heating, cooling, flushing) as well as safety devices must be employed. These decisions are to be made by the user. The decision to use this or any other Chesterton product in a particular service is the customer's responsibility.

INSTALLATION

8 Install bushing in bottom of stuffing box. If no bushing is required proceed with packing installation (Figure 3).

9 Insert the first ring of packing into the stuffing box and use a tamping tool to firmly seat the packing against the bottom of the box (or bushing).

10 Insert the next ring of packing into the stuffing box and use a tamping tool to firmly seat this ring of packing against the previously inserted ring, staggering ring joints 90°. Repeat this procedure for all the packing rings that are to be installed.

11 Install the gland nose, gland and gland bolts; finger tighten bolts.

12 Mark the gland nose with the compression value calculation from Step 5 (from the stuffing box face toward outboard) (Figure 4a).

13 Use a wrench to alternately tighten the gland bolts/nuts until the nose has traveled the marked distance (from Step 5) (see Figure 4b) into the stuffing box.

14 Use a torque wrench to measure and record the torque value applied to the packing gland bolts in Step 13.

15 Fully stroke the valve 10 times. Re-apply the measured torque.

16 Repeat Step 9 until the gland nuts rotate less than 1 flat when original torque measurement is applied.

17 Ready for Start-up (Figure 5).

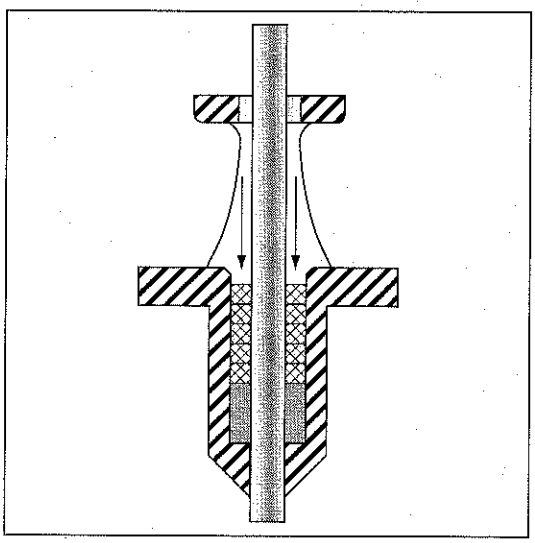


Figure 3

START-UP AND MAINTENANCE

18 Observe all plant and equipment manufacturer's safety procedures to return valve to service.

19 Check equipment after a few hours of service and make gland adjustments as necessary.

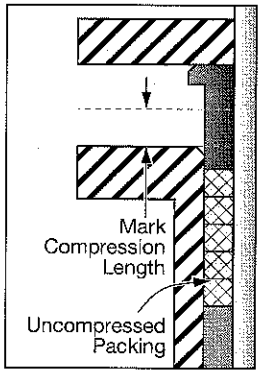


Figure 4a

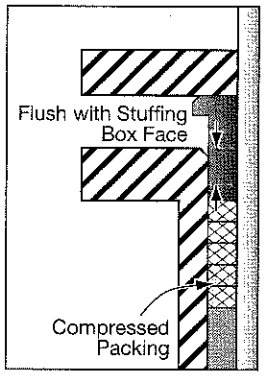


Figure 4b

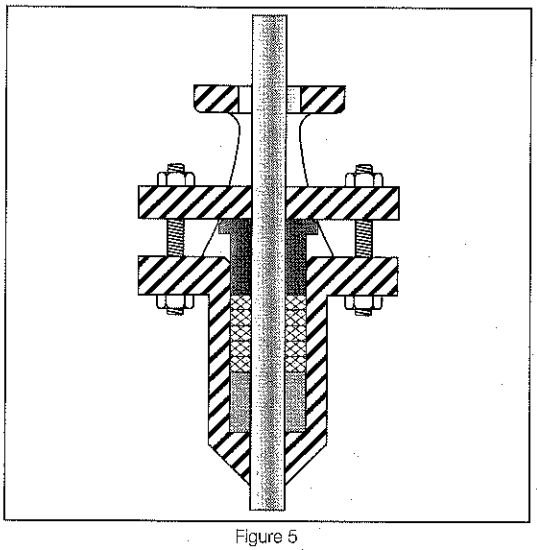


Figure 5

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Chesterton ISO certificates available on www.chesterton.com/corporate/iso

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1724 PRODUCT DATA SHEET

1.0 SCOPE

1.1 This specification describes 1724 Super-Lon 100% polytetrafluoroethylene (PTFE) Packing.
1.2 It is applicable for use to seal general valves, control valves, reciprocating rods, and low speed centrifugal shafts against the strongest chemicals, steam, and solvents to 500°F (260°C).

2.0 CONTENT AND CONSTRUCTION

2.1 Content
  2.1.1 Yarn
  • 2.1.1.1 1724 shall be made of single ply, multi-filament, continuous PTFE yarn.
  2.1.2 Lubricants
  • 2.1.2.1 The yarn shall be prelubricated with a tetrafluoroethylene (TFE) suspensoid lubricant.
2.2 Construction
  2.2.1 Packing of 1/8" through 6mm shall be square braided.
  2.2.2 Packing of 1/4" through 1" shall be interbraided.

3.0 TYPICAL PHYSICAL, THERMAL, AND CHEMICAL CHARACTERISTICS

3.1 Physical Characteristics
  3.1.1 Pressure Rating in a Valve Service – 3000 PSI (206 Bar)
  3.1.2 Maximum Shaft Speed – 600 FPM (3.0 MPS)
3.2 Thermal Characteristics
  3.2.1 Maximum Service Temperature – 500°F (260°C)
  3.2.2 Minimum Service Temperature – -310°F (-190°C)
3.3 Chemical Characteristics
  3.3.1 Service pH Range – 0 to 14
  3.3.2 Chemical Incompatibility – Fluorine (F_2), ClF_3 and related compounds, and molten alkali metals.

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FORM NO. E72066 PRINTED IN USA 04/08

1724E
Installation Instructions

Live Load Kit Designed by Chesterton to fit Fisher® Valve Body Design E

1. **Precaution:** System should be shut down, depressurized, drained, and cool before valve is handled. Observe all plant safety requirements.
2. **Check the condition of the valve for the following:**
   - A 10 to 32 RMS (7.5 to 24 Ra) stem finish is required.
   - The stuffing box bore should be 125 RMS (94 Ra) or better finish.
   - The stem run out should not exceed ±0.010 TIR/FT (±0,25 TIR/M).
   - The Packing Box Ring should be in the bottom of the stuffing box.
3. The stuffing box must be clean, i.e. completely free of any previous packing or foreign material. The valve stem must be clean, free of nicks, scratches and burrs.
4. Verify the split sleeve height provided is correct. The height of the sleeve should be 0.187" shorter than the calculated height. The calculated height is the difference between the stuffing box depth and the measured packing set height. The packing height is approximately five times the cross section for the 1724 packing set. Install the Split Sleeve in the bottom of the stuffing box. Make sure the two halves align and are seated properly on the stuffing box bottom.
5. Install one ring of 1724 packing using a Chesterton Valve Tamping Tool. Care must be taken to insure the skive-cut ends are properly mated. Firmly tamp the ring to the bottom of the box. Install remaining rings in the same manner staggering joints 90 degrees. *See Packing Configuration*
6. Install the new gland studs provided. Verify the B7 studs and the 2H nuts provided are of the same or better grade than the studs and nuts being replaced.
7. Install the packing follower and packing gland flange. Make sure the packing follower enters into the stuffing box.

   Note: If the Packing Gland Flange is of the older type, the two raised surfaces on the top of the flange should be machined flat to permit the proper installation of the live loading assemblies.
8. Lubricate the studs, bottom of the nuts, and live loading assembly components (belleville springs and flat washer) with Chesterton recommended anti-seize compound. Verify the springs and flat washers are properly stacked. *(See Packing Configuration)*
9. Install a live loading assembly on each stud. The cut away portion of the outer guide should face the stem.
10. Install the two packing gland nuts. Tighten each nut until finger tight. Alternately tighten the gland nuts until the top surface of the flat washer is flush or even with the top, flat surface of the outer guide. Verify that the packing gland is square and perpendicular to the stem.
11. To properly consolidate the packing: Actuate the valve 10 times, retighten the packing gland nuts at the end of the last down/in-stroke. Actuate the valve 10 more times, retighten the packing gland nuts at the end of the last down/in-stroke.
12. Follow normal safety precautions when returning the valve to service.
13. It is advisable to check gland adjustment after a few hours of service. Take up as necessary.

If the valve does not actuate properly at the compressed assembly height, release all packing gland load completely. Then gradually tighten the packing gland nuts until no leakage is observed. Do not tighten to the point where the stem will not actuate. *Reference Torque and Friction Values.*

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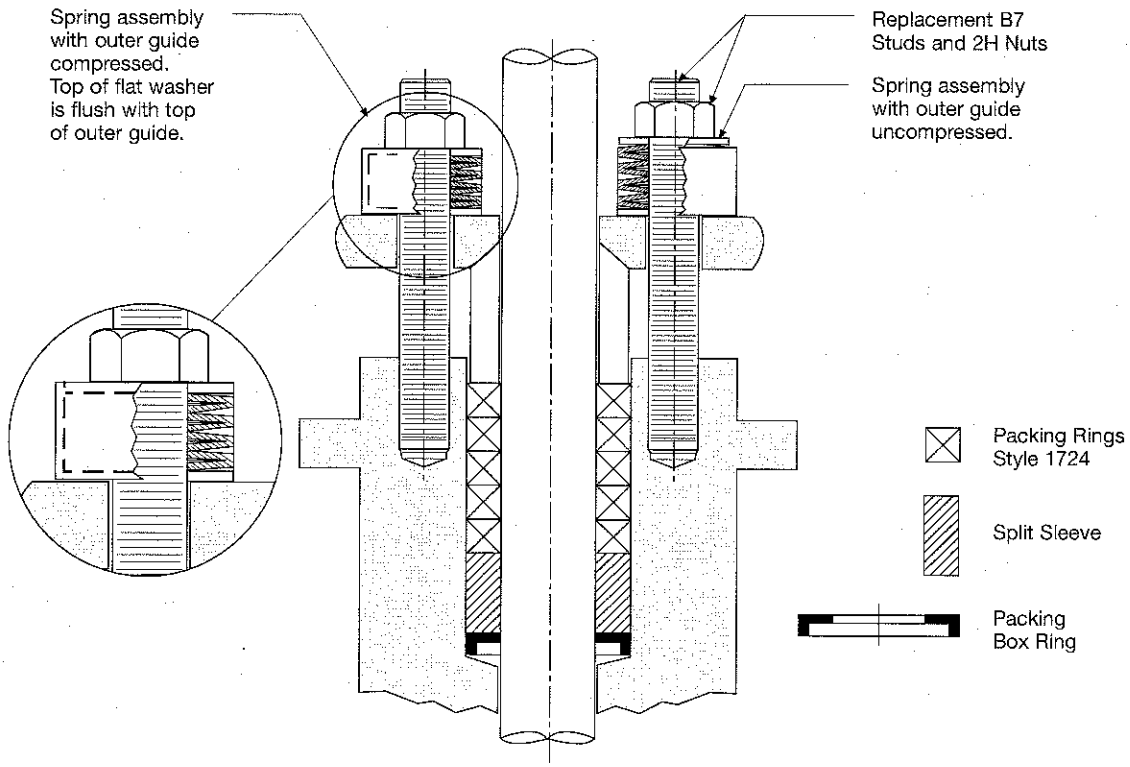
PACKING CONFIGURATION



Radial Min. Inches/mm	Uncompressed Axial Min. Inches/mm	Compressed Height Inches/mm	Bolt Diameter Inches/mm	Spring Configuration	AWC Live Load Item #
0.480 / 12,19	0.785 / 20,0	0.688 / 17,47	0.312 / 7,92	1 in par/8 in ser	030776
0.480 / 12,19	0.835 / 21,21	0.764 / 19,40	0.437 / 11,10	1 in par/8 in ser	030912
0.650 / 16,51	0.977 / 24,81	0.883 / 22,42	0.562 / 14,27	1 in par/8 in ser	030959
0.650 / 16,51	1.007 / 25,57	0.883 / 22,42	0.562 / 14,27	1 in par/8 in ser	031023

Torque and Friction Values

BODY RATING : CLASS 150 & 300									
Valve Size Inches	Stem O.D. Inches/mm	Box I.D. Inches/mm	Bolt/Stud Dia. Inches/mm	Bolt/Stud Length Inches/mm	Box Depth Inches/mm	LL Item #	Complete Kit * Item #	Predicted Packing Friction Lbs. / kg	Torque Ft-lbs / N.m
1 – 1.5	0.375 / 9,5	0.875 / 22,2	0.312 / 7,9	2.750 / 69,9	2.562 / 65,07	030776	148004	87.0 / 39,5	5.0 / 6,8
2 / 3 / 4	0.500 / 12,7	1.000 / 25,4	0.437 / 11,1	3.250 / 82,5	3.500 / 88,90	030912	148005	132.3 / 60,0	6.5 / 8,8
6 / 8	0.750 / 19,0	1.375 / 34,9	0.562 / 14,3	4.250 / 108,0	3.812 / 96,82	030959	148006	159.4 / 72,3	8.5 / 11,5
BODY RATING : CLASS 600									
Valve Size Inches	Stem O.D. Inches/mm	Box I.D. Inches/mm	Bolt/Stud Dia. Inches/mm	Bolt/Stud Length Inches/mm	Box Depth Inches/mm	LL Item #	Complete Kit * Item #	Predicted Packing Friction Lbs. / kg	Torque Ft-lbs / N.m
6 / 8	0.750 / 19,0	1.375 / 34,9	0.562 / 14,3	4.250 / 108,0	3.812 / 96,82	031023	148007	193.2 / 86,6	13.0 / 17,6

**Kits designed to fit the following Fisher® Valve Models: EAC, EAD, EC, ED, EHAT, EHD, EHT, EJ, EP, ES, ENC, END, ENJ, EWPP, AND ENS.*

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5100 PRODUCT DATA SHEET

1.0 SCOPE

1.1 This specification describes the requirements for 5100 Split Carbon Sleeves.
1.2 5100 is applicable for use in stuffing boxes which require a spacer.
1.3 5100 shall contain no fillers or binders.

2.0 CONTENT

2.1 Content, % by weight
- 2.1.1 Carbon/Graphite – 99% minimum
- 2.1.2 Ash – 1% maximum
- 2.1.3 Moisture – 1% maximum

3.0 TYPICAL PHYSICAL, THERMAL, AND CHEMICAL CHARACTERISTICS

3.1 Physical Characteristics
- 3.1.1 5100 shall be machined with the following tolerances in addition to engineered clearances:
  ID: +.005", -.000" (+0,13mm, -0,00mm)
  OD: +.000", -.005" (+0,00mm, -0,13mm)
  Hgt: ±.020" (±0,51mm)

3.2 Thermal Characteristics
- 3.2.1 Maximum Service Temperature – 5000°F (2760°C) in a non-oxidizing atmosphere
  800°F (430°C) in an oxidizing atmosphere
- 3.2.2 Minimum Service Temperature - -400°F (-240°C)

3.3 Chemical Properties
- 3.3.1 Chemical Incompatibilities – avoid oleum, fuming nitric acid, aqua regia, fluorine and hydrochloric acid.

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MATERIAL SAFETY DATA SHEET

in accordance with 1907/2006/EC - REACH (1272/2008/EC)

1. IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Name: 1622

Revision: 23 March 2011 **MSDS No.** 1140

Date of issue: 23 March 2011

Hazardous according to criteria of Safe Work Australia.

Company:	**Supplier:**
A.W. CHESTERTON COMPANY 860 Salem Street Groveland, MA 01834-1507, USA Tel.: +1 978-469-6446 Fax: +1 978-469-6785 (Mon. - Fri. 8:30 - 5:00 PM EST) E-mail (MSDS questions): ProductMSDSs@chesterton.com E-mail: customer.service@chesterton.com MSDS requests: www.chesterton.com	

For Chemical Emergency:
24 hours per day, 7 days per week
Call Infotrac: 1-800-535-5053
Outside N. America: +1 352-323-3500 (collect)

Use: Block Valve Packing for VOC emissions services to 850°F (454°C) in oxidizing environments, 1200°F (650°C) in non-oxidizing environments. Suitable for pressures to 3800 psi (262 bar).

2. HAZARDS IDENTIFICATION

Limited evidence of a carcinogenic effect. PTFE is nonhazardous at ambient temperatures. At temperatures above 260°C (500°F), toxic decomposition products may be emitted. Due to toxic decomposition, avoid smoking (wash hands to avoid transfer to tobacco products) when handling PTFE products.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredients[1]	**% Wt.**	**CAS No.**	**EC No.**	**Symbol**	**R-phrases**
Graphite	60-70	7782-42-5	231-955-3	–	–
Silica (Quartz)	< 1	14808-60-7	238-878-4	–	–
Molybdenum Trioxide	1-5	1313-27-5	215-204-7	Xn	36/37-40

[1]Classified according to:
* 29 CFR 1910.1200, 1915, 1916, 1917
* Mass. Right-to-Know Law (ch. 40, M.G.L..O. 111F)
* California Proposition 65
* Controlled Products Regulations
* 67/548/EEC, 1272/2008/EC (ATP01) 99/45/EC and 75/324/EEC
* Worksafe Australia [NOHSC: 1008 (2004)]

4. FIRST AID MEASURES

Inhalation: If overcome by decomposition fumes, remove to fresh air. If not breathing, administer artificial respiration. Contact physician.

Skin Contact: Wash skin with soap and water. Contact physician if irritation persists.

Eye Contact: Flush eyes for at least 15 minutes with large amounts of water. Contact physician if irritation persists.

Ingestion: not applicable

Advice to Physician: Treat symptoms.

5. FIRE-FIGHTING MEASURES

Extinguishing Methods: Carbon Dioxide, dry chemical, foam or water spray

Unusual Fire and Explosion Hazards: Toxic fumes may be emitted at temperatures above 260°C (500°F).

Special Fire Fighting Measures: Recommend Firefighters wear self-contained breathing apparatus.

Flammability Classification: –

HAZCHEM Emergency Action Code: 2 Z

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Utilize exposure controls and personal protection as specified in Section 8.

Environmental Precautions: No special requirements.

Methods of Clean Up: No special steps required. Nontoxic.

7. HANDLING AND STORAGE

Handling: Avoid breathing dust during removal, drilling, grinding, sawing or sanding. Utilize exposure controls and personal protection as specified in Section 8. Accumulations of graphite may cause shorting of electrical circuits. Do not smoke when handling PTFE products; wash hands after handling to avoid transfer to tobacco products.

Storage: Store in cool, dry area. Exposure to heat, humidity, ozone or light may shorten its unlimited shelf life.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Hazardous Ingredients	OSHA		ACGIH TLV		AUSTRALIA	
	ppm	mg/m^3	ppm	mg/m^3	ppm	mg/m^3
Graphite	15 mppcf (resp)		(resp)	2	(resp)	3
Silica (Quartz)	(resp)	10/(%SiO_2+2)	(resp)	0.025	–	0.1
	(total)	30/(%SiO_2+2)				
Molybdenum Trioxide	–	15	–	10 (resp) 3	–	10

Respiratory Protection: Not normally needed. If exposure limit is exceeded, use approved dust respirator.

Ventilation: If using under extreme heat, use local exhaust.

Protective Gloves: Use appropriate gloves.

Eye Protection: Recommend safety glasses.

Other: Long sleeves, long pants and good personal hygiene to minimize skin contact.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	solid	**Odour**	odorless
Colour	gray	**Vapour pressure @ 20°C**	not applicable
Initial boiling point	not applicable	**% Aromatics by weight**	not applicable
Melting point	not determined	**pH**	not applicable
% Volatile (by volume)	not applicable	**Density**	not applicable
Flash point	not applicable	**Weight per volume**	not applicable
Method	not applicable	**Coefficient (water/oil)**	not applicable
Viscosity	not applicable	**Vapour density (air=1)**	not applicable
Autoignition temp.	not determined	**Rate of evaporation (ether=1)**	not applicable
Explosion limits	not applicable	**Solubility in water**	insoluble
		Other	none

10. STABILITY AND REACTIVITY

Stability: Stable

Hazardous Polymerization: Will not occur.

Hazardous Decomposition Products: Carbon Monoxide, Carbon Dioxide, trace amounts of Hydrogen fluoride, Perfluorocarbon olefins, and other toxic fumes may be evolved above 260°C (500°F).

Conditions to Avoid: Extreme heat above 260°C (500°F).

Materials to Avoid: Fluorine, Chlorine Trifluoride and related compounds and molten alkali metals.

11. TOXICOLOGICAL INFORMATION

Primary Route of Exposure Under Normal Use: Inhalation, skin and eye contact. Personnel with pre-existing chronic respiratory impairments are generally aggravated by exposure.

Acute Effects: Graphite and Molybdenum Trioxide may cause mechanical irritation of the skin, eyes and nasal passages. PTFE is nontoxic at ambient temperatures. However, small quantities of toxic gases may be produced at temperatures above 260°C (500°F), due to PTFE decomposition. Inhalation of these decomposition products may cause temporary flu-like symptoms.

Chronic Effects: Limited evidence of a carcinogenic effect (Molybdenum Trioxide). Repeated inhalation of nuisance dust in excess of exposure limits over an extended period of time may result in injury to the lungs. Symptoms can include cough, shortness of breath and decrease in pulmonary function.

Other Information: The International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) have classified inhaled silica as a human carcinogen.

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. The information given below is based on a knowledge of the components and the ecotoxicology of similar substances.

Mobility: Solid. Insoluble in water. In determining environmental mobility, consider the product's physical and chemical properties (see Section 9).

Degradability: Graphite, Silica, Molybdenum Trioxide: inorganic substances, exist in nature. PTFE: Material is chemically unreactive and nonbiodegradable.

Accumulation: not determined

Ecotoxicity: not determined

13. DISPOSAL CONSIDERATIONS

Check local, state and national/federal regulations and comply with the most stringent requirement. This product is classified as a hazardous waste according to 91/689/EEC.

EWC-code: 06 13 99

14. TRANSPORT INFORMATION

TDG:	NONHAZARDOUS, NOT REGULATED
IMDG:	NONHAZARDOUS, NOT REGULATED
IATA/ICAO:	NONHAZARDOUS, NOT REGULATED
ADR/RID:	NONHAZARDOUS, NOT REGULATED

U.S. DOT :
Shipping Name: NONHAZARDOUS
Hazard Class: NOT REGULATED
UN/NA # : NOT APPLICABLE
Packaging Group # NOT APPLICABLE
Emergency Response Guide Book No. - NOT APPLICABLE

15. REGULATORY INFORMATION

European Classification[1]:	Xn - Harmful
R-Phrase(s):	Limited evidence of a carcinogenic effect.
S-Phrase(s):	Do not breathe dust. Wear suitable protective clothing and gloves.
Name of the substances on the label:	Molybdenum Trioxide
Other information:	none
Canadian Classification[1]:	D2B: Toxic materials causing other effects D2A: Very toxic materials causing other effects
Risk Phrase(s):	Prolonged, excessive inhalation of Graphite dust has caused emphysema and pneumoconiosis. IARC has classified inhaled silica as a human carcinogen.
Precautionary and First Aid Measure(s):	Do not breathe dust. Wear suitable protective clothing and gloves. After contact with skin, wash with soap and water. If affected by inhalation of dust, move to fresh air. Contact physician immediately.
Other Information:	none

16. OTHER INFORMATION

US EPA SARA TITLE III

312 Hazards : Immediate, Delayed

313 Chemicals : Molybdenum Trioxide

Hazardous Materials Identification System (HMIS)

4 = Severe Hazard
3 = Serious Hazard
2 = Moderate Hazard
1 = Slight Hazard
0 = Minimal Hazard
* = See Section 8

HEALTH	**1**
FLAMMABILITY	**1**
REACTIVITY	**1**
Personal Protection	*

JAPAN PRTR

Class I Chemicals : Molybdenum Trioxide

Class II Chemicals : none

Risk phrases in section 3: R36/37: Irritating to eyes and respiratory system.
R40: Limited evidence of a carcinogenic effect.

Changes to the MSDS in this revision: Original issue.

This information is based solely on data provided by suppliers of the materials used, not on the mixture itself. No warranty is expressed or implied regarding the suitability of the product for the user's particular purpose. The user must make their own determination as to suitability.

designed to open automatically in the event of a process upset are exempt from the requirements of paragraphs (a), (b) and (c) of this section.

(e) Open-ended valves or lines containing materials which would autocatalytically polymerize or would present an explosion, serious overpressure, or other safety hazard if capped or equipped with a double block and bleed system as specified in paragraphs (a) through (c) of this section are exempt from the requirements of paragraphs (a) through (c) of this section.

[49 FR 23513, June 6, 1984, as amended at 65 FR 78282, Dec. 14, 2000]

§ 61.242–7 Standards: Valves.

(a) Each valve shall be monitored monthly to detect leaks by the method specified in § 61.245(b) and shall comply with paragraphs (b)–(e), except as provided in paragraphs (f), (g), and (h) of this section, § 61.243–1 or § 61.243–2, and § 61.242–1(c).

(b) If an instrument reading of 10,000 ppm or greater is measured, a leak is detected.

(c)(1) Any valve for which a leak is not detected for 2 successive months may be monitored the first month of every quarter, beginning with the next quarter, until a leak is detected.

(2) If a leak is detected, the valve shall be monitored monthly until a leak is not detected for 2 successive months.

(d)(1) When a leak is detected, it shall be repaired as soon as practicable, but no later than 15 calendar days after the leak is detected, except as provided in § 61.242–10.

(2) A first attempt at repair shall be made no later than 5 calendar days after each leak is detected.

(e) First attempts at repair include, but are not limited to, the following best practices where practicable:

(1) Tightening of bonnet bolts;

(2) Replacement of bonnet bolts;

(3) Tightening of packing gland nuts; and

(4) Injection of lubricant into lubricated packing.

(f) Any valve that is designated, as described in § 61.246(e)(2), for no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background, is exempt from the requirements of paragraph (a) if the valve:

(1) Has no external actuating mechanism in contact with the process fluid;

(2) Is operated with emissions less than 500 ppm above background, as measured by the method specified in § 61.245(c); and

(3) Is tested for compliance with paragraph (f)(2) initially upon designation, annually, and at other times requested by the Administrator.

(g) Any valve that is designated, as described in § 61.246(f)(1), as an unsafe-to-monitor valve is exempt from the requirements of paragraph (a) if:

(1) The owner or operator of the valve demonstrates that the valve is unsafe to monitor because monitoring personnel would be exposed to an immediate danger as a consequence of complying with paragraph (a); and

(2) The owner or operator of the valve has a written plan that requires monitoring of the valve as frequent as practicable during safe-to-monitor times.

(h) Any valve that is designated, as described in § 61.246(f)(2), as a difficult-to-monitor valve is exempt from the requirements of paragraph (a) if:

(1) The owner or operator of the valve demonstrates that the valve cannot be monitored without elevating the monitoring personnel more than 2 meters above a support surface;

(2) The process unit within which the valve is located is an existing process unit; and

(3) The owner or operator of the valve follows a written plan that requires monitoring of the valve at least once per calendar year.

§ 61.242–8 Standards: Pressure relief services in liquid service and connectors.

(a) If evidence of a potential leak is found by visual, audible, olfactory, or any other detection method at pressure relief devices in liquid service and connectors, the owner or operator shall follow either one of the following procedures, except as provided in § 61.242–1(c):

(1) The owner or operator shall monitor the equipment within 5 days by the method specified in § 61.245(b) and shall comply with the requirements of

CHESTERTON
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End User: _____

Location: _____

Chesterton Packing Installations for Valves Subject to Chesterton Valve Emissions Warranty

Valve Identification Number	Packing Type Installed	Installed Compression (in inches)	Measured Torque (in ft/lbs)	Installation Date	Authorized Installer Name

This certifies that valves listed above satisfy all conditions necessary to qualify for the A.W. Chesterton valve emissions warranty

Dated: _____

By / Title: _____